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ABSTRACT

The study attempted to demonstrate significant relationships between systematically derived occupational descriptors and selected measures of worker characteristics in the affective domain. The predictor variables were derived from the Occupation Analysis Inventory (OAI) and consisted of work-dimension scores describing occupations in terms of work activities and conditions, and attribute-requirement estimates characterizing occupation in terms of various human requirements. The worker variables were based on responses of job incumbents to selected interest, need, and satisfaction questionnaires. The results of various statistical analyses offered consistent support for the validity of the OAI descriptors. It was concluded that the OAI work-dimension scores and attribute-requirement estimates for occupations possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents and that these occupational variables should prove useful for a number of research and development purposes. (Author/MS)

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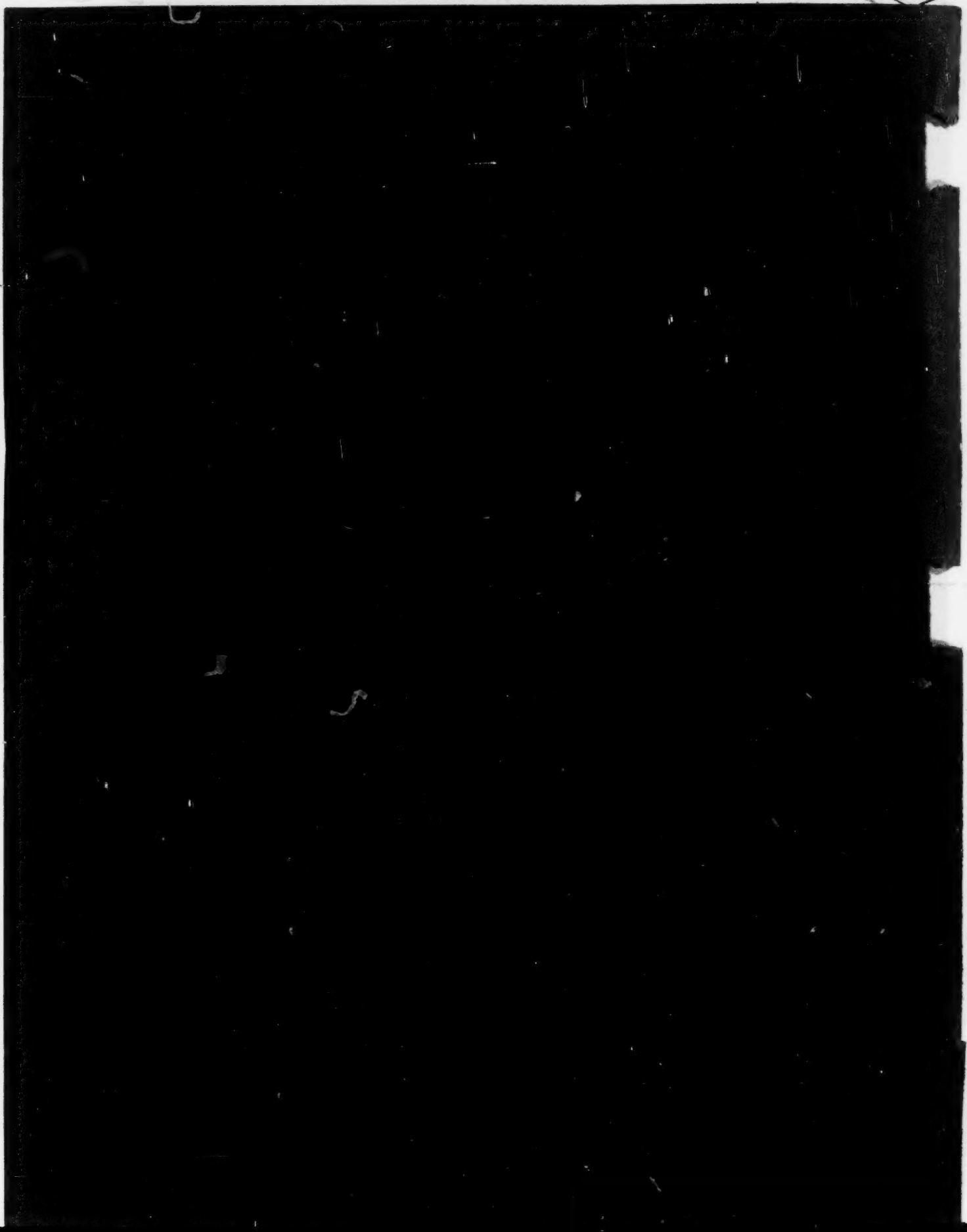

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AFFECTIVE CORRELATES OF SYSTEMATICALLY DERIVED WORK DIMENSIONS: VALIDATION OF THE OCCUPATION ANALYSIS INVENTORY

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Report No. 7 of the Ergometric Research and Development Series

Program Director: J. W. Cunningham

* *

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PREFACE

This is the seventh report in the Ergometric Research and Development Series of the Center for Occupational Education, and the first of two studies made to validate the structure and procedures of the Occupation Analysis Inventory (OAI). The second of these two validation investigations, dealing with cognitive correlates, will be published as Center Research Monograph No. 11. Earlier reports in this series presented the development of the OAI and outlined its potential applications. This and the next report in the series seek to support the validity of the OAI in research dealing with human behavior in the work environment.

The authors and the Center wish to express appreciation to various individuals and organizations who made this study possible. This includes Dr. D. W. Drewes, Dr. H. G. Miller, Dr. J. L. Wasik, and Mr. John J. Pass, all of North Carolina State University; Dr. David Weiss of the University of Minnesota; Mr. Michael Shaffer of Harcourt Brace Jovanovich, New York; and the 47 organizations whose employees participated in the research.

The Center is grateful to Dr. Tuttle and Dr. Cunningham for their work in preparation of this report. Thanks are also extended to Mrs. Joyce Pollard for typing the draft and final copies of the report, to Mrs. Sue King for editing the final manuscript, and to the entire Center clerical and technical staff for their contributions to the production of this monograph.

John K. Coster
Director

SUMMARY

This study was an attempt to demonstrate significant relationships between systematically derived occupational descriptors and selected measures of worker characteristics in the affective domain. The occupational (predictor) variables were derived from the Occupation Analysis Inventory (OAI) and consisted of work-dimension scores describing occupations in terms of work activities and conditions, and attribute-requirement estimates characterizing occupations in terms of various human requirements for which there are tests. The worker (criterion) variables were based on the responses of job incumbents to selected interest, need, and satisfaction questionnaires. It was reasoned that significant relationships between these two sets of variables would provide support for the construct validity of the occupational descriptors.

Job incumbents in selected occupations were administrered the Ohio Vocational Interest Survey, the Minnesota Importance Questionnaire, and the Minnesota Satisfaction Questionnaire. In addition, existing data were obtained for incumbents in a sample of occupations on the Strong Vocational Interest Blank, and Occupational Reinforcer Pattern scores for another sample of occupations were obtained from the Minnesota Work Adjustment Project. All occupations for which the above criterion data were obtained were rated on the Occupation Analysis Inventory (OAI), and these ratings were used in deriving work-dimension scores and attribute-requirement estimates for the occupations.

The results of various statistical analyses offered rather consistent support for the validity of the OAI descriptors. Of the seven general hypotheses tested concerning relationships between occupational and worker variables, five received substantial support and the remaining two were at least partially supported. It was concluded that the OAI work-dimension scores and attribute-requirement estimates for occupations possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents and that these occupational variables should prove useful for a number of research and development purposes.

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INTRODUCTION

Today's educators are faced with the task of preparing students for a work environment that is only vaguely defined and in a period of accelerating change. Moreover, the interests, needs, and occupational preferences of individuals often change appreciably over time, especially among adolescents and young adults. This situation, combined with the very large number and variety of occupations, makes it both impractical and undesirable to develop a comprehensive educational program geared to specific occupations. (There are 13,845 base and defined related titles in the 1965 edition of the Dictionary of Occupational Titles.) Although ultimately the individual must be able to perform specific tasks in a specific work setting, his educational experiences should provide him with occupationally related capabilities which are transferable across a range of jobs and which provide him with the prerequisites for further career development. As noted in a previous paper (Cunningham, Tuttle, Floyd, and Bates, 1971), however, an adequate framework does not exist for the development of a comprehensive and integrated program in occupational education; there is a need for a work taxonomy that would provide a sound, systematic basis for articulation between the educational and work domains.

One response to the need for structure and organization in occupational education is the concept of "occupational clustering." According to this concept, occupations can be grouped on some meaningful criterion of similarity, and students can be taught the core skills and knowledges relevant to these groups, or clusters. Presumably, such training would provide the student with both entry-level capabilities for one or more occupations and the prerequisite capabilities for lateral and vertical mobility within an occupational cluster.

Bushnell (1969) described the merits of the cluster concept as follows:

> The merits of job-clustering have been recognized as several-fold. First, the breadth of experience which a job-clustered curriculum offers prepares the student for a cluster of related occupations, insuring mobility and a shorter period of retraining if necessary. Second, a curriculum developed in this manner provides more relevance for students interested in not just one but a variety of occupations. Students required to develop a fundamental skill such as the addition of fractions can see its relevance to a host of occupations. Third, a cluster approach should be of some assistance in helping to break down the rigid barriers which have grown up between the different service areas of vocational education. Through job-clustering, the common job skills can be identified across

service lines. Adding fractions is as important to the building trades as it is to students interested in distributive education. Fourth, clustering helps to structure a curriculum in such a way that the student completing such a program should be able to advance more rapidly up a career ladder to higher levels of responsibility and income. Thus, vertical as well as horizontal structuring should provide the student with the kinds of experiences most likely to help him advance in his career. Fifth, through job-clustering, vocational education should establish once and for all the vocational educator's interest in the "total" man. It has been recognized for some time that attitudes, personality traits, and other adaptive skills are as important determinants of occupational success as are functional job skills. Job-clustering provides curriculum developers with the tools to incorporate these requirements into their curriculum design efforts. (pp. v-vi)

The cluster approach seems quite consistent with recent remarks made by Commissioner Sidney P. Marland, Jr., describing the new concept of "career education":

> . . . We obviously require greater emphasis on such new vocational fields as computer programmers and technicians, laser technicians, and jet mechanics. . . . Though when we speak of new occupations it is always useful to remind ourselves that even some of the newest, such as computer programming, for example, will very likely be obsolete in 20 years or so, affirming once again the need for a sound educational base underlying all specific skill training.
>
> Second . . . we must provide far more flexible options for high school graduates to continue on to higher education or to enter the world of work rather than forever sustain the anachronism that a youngster must make his career choice at age 14. This demands that we broaden today's relatively narrow vocational program into something approaching the true career education we would eventually hope to realize. Vocational students need much more than limited skills training if they are to go on to post-secondary education, whether at the community college or four year level. And young people presently drifting into the general education wasteland need realistic exposure to the world of work, as well as to the option of general post-secondary schooling. (1971, pp. 10-11)

Marland, in his behest for a "sound educational base" and "flexible options," seems to be asking for much of what Bushnell attributes to the cluster approach.

Cunningham (1971) has noted, however, that the cluster concept, despite its initial attractiveness, raises some troublesome questions.

> Although occupational clustering would appear to offer some promise for the complex and somewhat disorganized field of occupational education, two questions basic to this approach have thus far received little attention: What are the characteristics on which occupations are to be described, compared, and classified for educational purposes? And even assuming we could establish valid clusters of similar occupations without first defining a set of variables (or descriptors) for classification purposes, how would we then determine what common denominators should be incorporated into cluster curricula? (Cunningham, 1971, p. 4)

In regard to these questions, it was proposed that:

> . . . there is a need for a comprehensive set of work variables, or dimensions, which could be applied to the description and classification of occupations for educational purposes; that is, variables which would provide the basis for a quantitative work taxonomy suitable to educational problems. (Riccobono and Cunningham, 1971a, p. 1)

In response to this need, Cunningham and his associates (1971) undertook an "ergometric" project designed to develop a sound basis for describing, comparing, and grouping occupations for educational purposes. The first product of this project was a taxonomy of work variables which was expanded into a comprehensive instrument for analyzing jobs and occupations. This instrument is called the Occupation Analysis Inventory, or OAI. The OAI describes characteristics of work under five main categories: Information Input, Mediation (or mental) Processes, Work Behavior, Work Goals, and Work Context. These categories are further divided and subdivided into a final breakdown of more than 600 "work elements," or descriptions of work activities and conditions, on which jobs can be rated. The development and validation of the OAI were envisioned as the first phase of a long-range research and development program directed toward the problem of articulation between the educational and work domains (Cunningham et al., 1971).

Upon completion of the instrument, an attempt was made to establish linkages between the OAI work elements (items in the instrument) and certain measured human attributes in the cognitive, affective, and psychomotor domains (Neeb, Cunningham, and Pass, 1971). For this purpose an Attribute Requirement Inventory (ARI) was developed containing written descriptions of 103 human attributes for which there are tests. The bridge between the OAI and the ARI was established by having judges rate the relevance of each of the ARI attributes for each of the OAI work elements, or items. The average rating of each OAI element on each ARI attribute provided an attribute-requirement weight for the work element. A profile of 103 attribute-requirement weights was thus derived for each OAI work element. These profiles, in turn, provided the basis for deriving a profile of attribute-requirement estimates for any job rated on the OAI.

The next part of the project involved the derivation of a comprehensive set of work dimensions that could be used in describing, comparing, and clustering jobs and occupations. The work dimensions were derived in two ways: (1) a large representative sample of occupations was rated with the OAI, and the OAI items (work elements) were factor analyzed based on these data (Riccobono and Cunningham, 1971a, 1971b); and (2) OAI items were intercorrelated and factor analyzed based on their attribute-requirement profiles (Neeb et al., 1971). The resulting factors comprise two sets of work dimensions: one defined by work activities and conditions (work elements) that tend to coexist in jobs, and the other by work elements that tend to have similar human attribute requirements.

Thus, any job or occupation rated on the OAI can be described on two different bases: (1) by a profile of scores on work dimensions representing observable activities and conditions and (2) by a profile of scores representing the job's requirements for a set of 103 defined human attributes for which there are tests. In addition to describing individual jobs and occupations rated on the OAI, the work-dimension profiles provide a quantitative basis for comparing and clustering occupations. The resulting clusters can, in turn, be described by the average work-dimension and attribute-requirement profiles of their constituent occupations.

There are several potential applications for the previously described OAI system (Cunningham et al., 1971). One obvious application is in the area of curriculum development. It might be possible, for example, to develop educational programs at different grade levels based on OAI-derived occupational clusters. Since clusters can be formed which vary in specificity, one might start with broad, general clusters for early and middle grades curricula (e.g., occupational awareness and exploration curricula) and proceed to more specific clusters for the more advanced and focused curricula. In each case, the work-dimension and attribute-requirement profiles (as well as the individual work elements comprising each dimension) would define the clusters and provide information to the curriculum builder. It might also prove feasible to develop certain kinds of modular curricula (e.g., general occupational capabilities curricula) corresponding to selected OAI work dimensions.

A second potential application lies in the area of occupational guidance and placement. As mentioned, the OAI system provides a basis for estimating the requirements of occupational clusters in terms of measured human attributes. With this information, the counselor could compare the student's test-score profile with the attribute-requirement profiles of various occupational clusters and recommend curricular areas for the student's consideration. Moreover, the OAI work-dimension profiles of occupations and occupational clusters could be translated into information that could be used by the student in career exploration and decision-making. Such a system would lend itself readily to a computer-based counseling system which would allow the computation of correspondence indices between the student's test-score profile and the

attribute-requirement profiles of various occupational clusters. This would free the counselor from much clerical work and allow more information to be passed on to the student.

Other possible applications lie in such areas as curriculum evaluation, test development, and educational planning (Cunningham et al., 1971). Basic to each of these potential applications is the requirement for systematically gathered and organized information about the world of work. The job analysis procedure which has been developed provides a means of obtaining such information.

PURPOSE

Before the proposed OAI system can be applied, it should be subjected to some extensive validation. Since the OAI was designed to describe jobs and occupations in terms relevant to human behavior, it was decided to validate the OAI work descriptors against various measures of behavioral potential (Cunningham et al., 1971). The present study was an attempt to demonstrate significant relationships between the OAI work variables (i.e., the OAI work-dimension scores and attribute-requirement estimates) and selected measures in the affective domain. With one exception, the selected criteria were based on the responses of job incumbents to interest, need, and satisfaction questionnaires.

The purpose of the study was twofold:

(1) To determine if clusters formed by occupations with similar OAI work-dimension profiles would be discriminable in terms of the interest and need questionnaire responses of persons employed in the occupations; and

(2) To determine if there were significant relationships between the OAI interest- and need-requirement[1] (or reinforcement) estimates for a sample of occupations and three sets of criterion variables: (a) scores of job incumbents on corresponding interest and need scales; (b) satisfaction scores of job incumbents; and (c) Occupational Reinforcer Patterns from the Minnesota Work Adjustment Project (Borgen et al., 1968). (The last two sets of variables were used as criteria only for the OAI need-requirement estimates.)

The objectives of the study are more fully explicated in a later section.

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[1]The term "requirement" is used here in order to maintain consistency with the use of the expression "attribute-requirement estimates" in reference to the OAI estimates of the human attribute correlates of jobs and occupations. Although this term is appropriate when used with abilities, the term "reinforcement" would actually be more appropriate in the case of interests and needs.

REVIEW OF THE LITERATURE

The following review deals with concepts and research relevant to the present study. It covers four topics: (1) the concept of individual-environmental congruence, (2) job satisfaction as a criterion of congruence, (3) various theories of job satisfaction, and (4) assumptions related to the three preceding topics that have been adopted for purposes of this study.

The Concept of Individual-Environmental Congruence

Attempts to related characteristics of people to characteristics of jobs have occupied vocational and industrial psychologists for some time. Basic to these efforts has been the assumption that a person's adjustment to his work depends upon an interaction between relatively stable (and measurable) characteristics of the individual and various observable characteristics of the work environment, and a corollary of that assumption, that occupational adjustment can be enhanced through the systematic matching of individual and environmental variables. This notion, sometimes referred to as the "trait-factor" approach, has served as the conceptual basis for numerous attempts to define and measure human attributes (such as abilities, interests, and needs), relate these attributes to observable characteristics of the work environment, and predict the behavioral outcomes of various individual-environmental relationships.

One of the first investigators to use the concept of individual-environmental congruence in the applied setting was Frank Parsons (1909), the father of the vocational guidance movement, who defined three critical ingredients in the vocational decision-making process:

> . . . (1) a clear understanding of yourself, your aptitudes, abilities, interests, ambitions, resources, limitations, and their causes; (2) a knowledge of the requirements and conditions of success, advantages and disadvantages, compensation, opportunities, and prospects in different lines of work; (3) true reasoning on the relations of these two groups of facts. (p. 5)

Pursuant to his prescription, Parsons devised a scheme for vocational guidance which dealt explicitly with characteristics of jobs and individuals for the purpose of obtaining the optimal match.

Another early proponent of individual-environmental congruence was Henry Link (1919), who recognized that ". . . it is useless for an employment manager to be able to analyze people unless he is able to

analyze equally well the positions in which he intends to place them" (p. 251). In this connection, Link suggested a type of "psychological job analysis" involving a careful study of a job, followed by a definition of the ability requirements of the job in terms of tests purporting to measure these abilities. These tests were then validated against performance criteria, and the tests that proved to be valid were accepted as operational definitions of the job requirements. Although the procedure for choosing tests was not very systematic, it did recognize the importance of analyzing job environments, as well as determining the characteristics of individuals, for personnel selection and vocational counseling purposes.

Somewhat later, Viteles (1932) developed a more systematic procedure for estimating the human requirements of jobs. The "job psychographic" method involved obtaining ratings of the extent to which 32 defined traits were necessary for success on a job. For a particular job, ratings were then graphically recorded on a form such that traits rated as important to job success formed peaks on the graph. These "keystone specific mental abilities" were considered the essential attributes to be measured in predicting job success.

The Minnesota Occupational Rating Scales (Paterson, Gerken, and Hahn, 1941) represent another early systematic attempt at determining the human attribute requirements of jobs. The Minnesota scales contained a list of 430 jobs rated for their requirements on six human abilities. The ratings yielded profiles of ability-requirement estimates for the jobs, which were offered for use by counselors in relating individual test profiles to job requirements. The Minnesota scales have since been revised and now include additional occupations and ratings on an additional ability scale (Paterson, Gerken, and Hahn, 1953). In the revised scales, the ability levels to be rated were simplified, and DOT numbers were assigned for cross reference purposes. In addition, a Counseling Record was developed to aid counselors in relating test-score profiles to jobs.

The period since World War II has seen a good deal of additional research devoted to the problem of relating the measurable characteristics of people and jobs in accordance with the concept of individual environmental congruence (e.g., Fine, 1958, 1969; Fine and Heinz, 1957; Lawshe, 1952; Lawshe and Steinberg, 1955; McCormick, 1959; McCormick et al., 1957, 1967, 1972; Primoff, 1957, 1959). However, since comprehensive reviews of these efforts can be found elsewhere (Cunningham, 1971; Neeb, Cunningham, and Pass, 1971; Prien and Ronan, 1971), the remainder of this review will focus upon only one facet of the congruence problem: the definition and measurement of human affective characteristics relevant to the work environment.

Job Satisfaction as an Indicator of Congruence

Job satisfaction has been a topic of considerable interest among industrial psychologists for some time. Some investigators have

attempted to establish job satisfaction as a valid indicator of individual-job congruence by relating satisfaction scores to job performance measures, while others have correlated this variable with tenure and absenteeism. From the existing body of research, Lawler and Porter (1967b) conclude that job satisfaction is related to all three of the forenamed criteria, although its relationship to performance is somewhat weaker and less consistent than its relationships to turnover and absenteeism. (However, as noted later in the present review, their basic assumption concerning the direction of these relationships conflicts with that of previous theorists.) These empirical relationships are offered by Lawler and Porter as justification for the continued study of job satisfaction.

A comprehensive review of the literature related to job satisfaction will not be undertaken here, since several are already available, notably: Brayfield and Crockett (1955); Herzberg, Mausner, Peterson, and Capwell (1957); Vroom (1964); Graen (1967); Pallone, Rickard, and Hurley (1970); and Ronan (1970). Instead, the present review will consider three selected theoretical approaches to the study of work motivation and satisfaction: Herzberg's two-factor theory, instrumentality-expectancy theory, and the need fulfillment theories.

Two-Factor Theory

The approach that has probably generated the most research and controversy in the area of work motivation is Herzberg's two-factor theory (Herzberg, Mausner, and Snyderman, 1959), which broke with some of the traditional experimental approaches to job satisfaction. Herzberg's data collection techniques were somewhat clinical in nature, emphasizing structured in-depth interviews of job incumbents to determine what job incidents were associated in the past with satisfaction and what incidents were associated with dissatisfaction. These responses were subjected to content analyses, and various themes and commonalities in the stories were identified. Based on these analyses, Herzberg and his associates came to the conclusion that certain types of incidents and conditions were frequently associated with feelings of satisfaction on the part of workers, while others were regularly associated with dissatisfaction. The "satisfiers," as they came to be called, include job-content factors such as Achievement, Recognition, Advancement, Responsibility, and Work Itself; the "dissatisfiers" include job-context factors such as Company Policies and Practices, Interpersonal Relations with Co-Workers, Interpersonal Relations with Supervisors, Technical Aspects of Supervision, Salary, and Working Conditions. According to Herzberg *et al.*, if the satisfiers and dissatisfiers are both present at appropriate levels, then satisfaction will be high. On the other hand, if the satisfiers are removed, indifference but not dissatisfaction will result. Dissatisfaction will occur only when the negative aspects of the dissatisfiers are present; the positive aspects of these dissatisfiers constitute necessary but not sufficient conditions for satisfaction. Thus, job satisfaction is seen as a two-dimensional phenomenon which must be explained by a "two-factor" theory.

A considerable amount of research has been conducted in connection with Herzberg's theory, a formulation which has had both ardent supporters and ardent critics. In a recent review of some of this research, Behling, Labovitz, and Kosmo (1968) conclude that the reason for the controversy lies in the different methodologies employed. Those using the Herzberg methodology consistently find results agreeing with the two-factor theory, while those using questionnaire methods find considerable overlap between satisfiers and dissatisfiers. In this regard, Behling and his associates argue for a reorientation of job satisfaction research which recognizes that the phenomenon consists of many feelings about the job; that it is not unidimensional or bidimensional, but multidimensional. According to these authors,

> Efforts must be devoted to the development of many measuring devices and techniques which will provide reliable and internally consistent data indicative of important parts of the total attitudinal complex. Only then can steps be taken to relate those aspects of the entity we call job satisfaction to aspects of the job, its environment, and individual behavior on the job. (p. 108)

This assessment points to one of the drawbacks of the Herzberg theory: it fails to recognize the interaction between the individual and the work environment (i.e., it does not account for individual differences in environmental preference). From the standpoint of occupational guidance and placement, this omission in Herzberg's theory is a serious one.

Instrumentality Theory

Instrumentality theory, a somewhat eclectic approach to work motivation and satisfaction, borrows from concepts developed by Lewin (1938), Rotter (1955), Atkinson (1958), Tolman (1959), and others. The first writer to incorporate these ideas into a cohesive theory of work motivation was M. S. Vroom (1964), whose model, along with its subsequent modifications by others, is summarized below.

Concepts of Vroom's Model

Vroom's model incorporates the concepts of valence, instrumentality, expectancy, and force.

Valence refers to an individual's affective orientations toward specified outcomes. For example, occupying a job could be considered an outcome of an earlier decision, i.e., the decision to apply for the job. This outcome, in turn, can lead to such other outcomes as money, prestige, and meaningful social relationships. Occupying a job might be considered a first-level outcome, and its consequences would be called

second-level outcomes. The individual will have varying degrees of positive and negative affective orientations toward all outcomes.

Instrumentality refers to the likelihood that a first-level outcome will lead to a second-level outcome. According to Vroom, this likelihood takes values ranging from +1, indicating certainty that a second-level outcome will follow from a first-level outcome, to -1, indicating certainty that the first-level outcome will not lead to a particular second-level outcome. Thus, instrumentality might be defined as the "perceived correlation" between first- and second-level outcomes (Graen, 1969).

Based on these concepts, it is possible to define an individual's valence for a first-level outcome (e.g., occupying a work role) as ". . . a monotonically increasing function of the algebraic sum of the products of the valences of all other [i.e., second-level] outcomes and his conception of its instrumentality for the attainment of these other outcomes" (Vroom, 1964, p. 17). Accordingly, job satisfaction is defined as "the valence of the job or work role [a first-level outcome] to the person performing it" (p. 101).

Two additional concepts, expectancy and force, are used to account for the motivation of an individual to perform a particular act. Expectancy refers to the individual's subjective probability that the act in question will lead to a specific first-level outcome. The force upon an individual to perform that act is defined as:

> . . . a monotonically increasing function of the algebraic sum of the products of the valences of all outcomes and the strength of his expectancies that the act will be followed by the attainment of these outcomes. (Vroom, p. 18)

Essentially, the four preceding concepts, together with propositions concerning their relationships, comprise Vroom's model. Some modifications and extensions of Vroom's theory are discussed in the following paragraphs.

Graen's Modification of Vroom's Theory

Graen (1969) proposes a "modest extension" (p. 2) of Vroom's model and presents data to support it. He clarifies some ambiguity in Vroom's model relative to the distinction between first- and second-level outcomes by introducing the concepts of work role and role outcomes. According to Graen ". . . an individual's work role is defined as a set of behaviors expected by the organization and considered appropriate of an incumbent in a position within the organization" (p. 2). A work role is thus a first-level outcome whose attainment may or may not be instrumental for the attainment of second-level outcomes. The second-level outcomes are termed role outcomes by Graen and include such factors as feelings of achievement, recognition, responsibility, status, and money. The overall attraction of a work role ". . . depends

on the perceived attraction of various role outcomes and the perceived instrumentality of that work role for the attainment of these various role outcomes" (p. 3).

Satisfaction in Graen's model is accounted for in much the same way as in Vroom's model. The attraction of a work role is considered to be anticipated rather than realized satisfaction, though it seems reasonable to expect that anticipated and realized satisfaction would be similar for an incumbent who has occupied a work role for some period of time. This assumes that one's attraction for role outcomes remains stable and that the instrumentality for the work role changes very little after an initial period of adjustment. Under such conditions, realized satisfaction for an incumbent might be predicted in the same manner as attraction of a work role.

Another useful concept presented by Graen is his personality-role system, which treats individual work behaviors as outputs. The system components are work personality and work role. Work personality is defined in part as "a person's preferences for various consequences of attaining work roles and his dispositions for perceiving and evaluating various instrumentality and expectancy relationships" (p. 2). This type of conceptualization seems to have utility for both instrumentality theory and the need-fulfillment theories to be considered later.

The Lawler and Porter Models

The most active researchers currently applying instrumentality theory to work motivation are Lawler and Porter. In a series of articles (Lawler and Porter, 1967a, 1967b; Porter and Lawler, 1968; Lawler, 1969), these investigators have presented theoretical models and related research within a managerial context. This work has served both to extend instrumentality theory and put satisfaction research into a new persepctive.

Lawler and Porter's extension of instrumentality theory attempts to explain further the relationship between motivation and performance. One of their earlier articles (Lawler and Porter, 1967a) presents a theoretical model relating job attitudes to performance which borrows heavily from earlier instrumentality approaches to work motivation, most notably those of Vroom (1964) and Georgopoulos et al (1957). The principal attitudinal components of the model are value of rewards and effort-rewards probability. Value of rewards (cf. Vroom's valence) is defined "as the attractiveness of possible rewards or outcomes to the individual" (p. 125). The second variable, effort-rewards probability, refers to a subjective expectancy that a desired reward will result from certain levels of effort. In addition, Lawler and Porter consider the relationship between effort and performance, defining effort as the amount of energy an individual expends in a particular situation.

The following diagram (Figure 1) depicts the relationships among the variables in the Lawler and Porter model. The rule explaining how

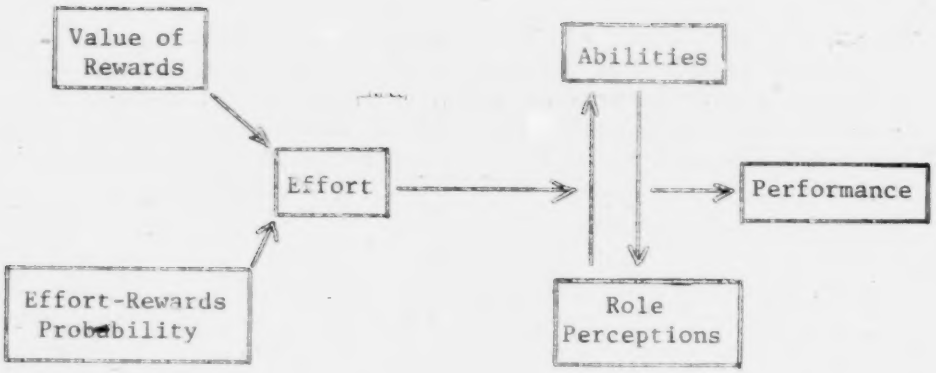

Figure 1. Lawler and Porter Model
(From Lawler and Porter, 1967a, p. 125)

value of rewards and effort-rewards probabilities interact to produce the level of effort is stated as follows:

> The greater the value of a set of rewards and the higher the probability that receiving each of these rewards depends on effort, the greater the effort that will be put forth in a given situation. (p. 128)

The remaining two variables in the model, abilities and role perceptions, mediate the relationship between effort and performance, accounting for relatively permanent characteristics of the individual as well as situational aspects of the work environment. Abilities represent the individual's "power to perform," while role perceptions refer to the individual's perception of the types of activities and behaviors that he should perform to accomplish his job successfully. Role perceptions may be accurate or inaccurate, depending on how closely they agree with the expectations of those evaluating the individual's performance.

Thus, the Lawler-Porter model extends the Vroom and Graen models by dealing explicitly with the determinants of job performance. As in Graen's model, some role concepts are used by Lawler and Porter; but Graen emphasizes the behavioral expectations which others have of the job incumbent, whereas Lawler and Porter emphasize the relationship between the role perceptions of the incumbent and those of the evaluator or supervisor. Nevertheless, as far as the determinants of force (or effort) are concerned, the differences between the three models seem to be more semantic than substantive. Even though slightly different explanations are given in this connection, the three models would lead to essentially the same predictions regarding the determinants of effort. Lawler and Porter do go beyond this point, however, in their attempt to explain the relationship between effort and performance.

The models also differ in their approach to job satisfaction. As mentioned earlier, both Vroom and Graen treat satisfaction as the

attraction of a work role for a person performing the role, that is, as a function of the instrumentality of the work role (a first-level outcome) for the attainment of other (second-level) outcomes and the valences of these other outcomes. Lawler and Porter, on the other hand, treat satisfaction as a function of performance in the work role, rather than merely occupying the work role (see Figure 2).

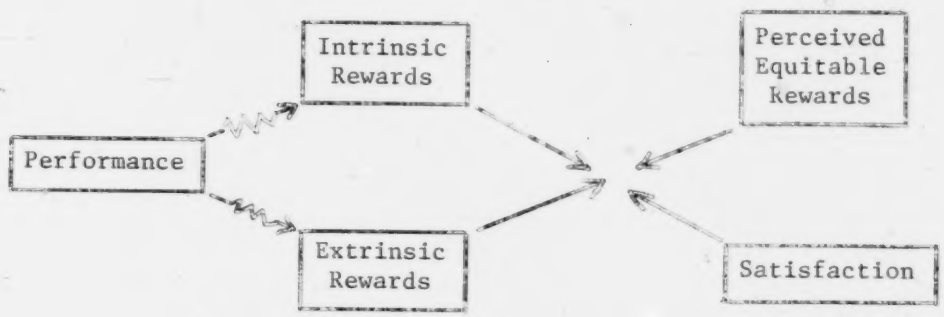

Figure 2. Lawler and Porter Model of Job Satisfaction (Lawler and Porter, 1967a, p. 23)

According to their model, performance leads to two types of rewards, intrinsic and extrinsic. Extrinsic rewards are seen as imperfectly related to performance because of frequent problems encountered in obtaining valid performance measures. Under such circumstances, it is difficult for management to reward performance directly. The relationship of intrinsic rewards to performance is more direct, however, since these rewards (e.g., feelings of accomplishment) can be given by the incumbent to himself. Lawler and Porter make a case for the value of satisfaction as an index of the extent to which an organization dispenses rewards contingent on effective performance. For example, a high level of employee satisfaction on the self-actualization needs may indicate that the organization has succeeded in providing jobs that are interesting and challenging.

In summary, Vroom's theory is primarily oriented toward the individual's perceptions. Although it takes into account differences among individuals, it does not account for variation in job factors except as they are perceived by individuals. For the study of satisfaction, this presents little difficulty when one deals with incumbents, since it is their perception of job outcomes that is important. However, for prospective incumbents whose knowledge of the job is limited, it is necessary to have some information concerning the "actual" outcomes of the job. Such information might be obtained from responses of incumbents or from ratings by people knowledgeable about the job.

Need Fulfillment Theories

A third approach to job satisfaction, need fulfillment, makes extensive use of the concept of individual-environment fit. This approach will be discussed in somewhat more detail than the previous two, since it contributes heavily to the rationale of the present study.

According to Hall and Lindzey (1957) the existence of a need may be inferred through:

> . . . (1) the effect or end result of the behavior, (2) the particular pattern or mode of behavior involved, (3) the selective attention and response to a particular class of stimulus objectives, (4) the expression of a particular emotion or affect, and (5) the expression of satisfaction when a particular effect is achieved or disappointment when the effect is not achieved. (pp. 172-173)

Of the numerous attempts to define and categorize human needs, one of the most ambitious was a taxonomy of 20 needs developed by Henry Murray (1938), who maintained that a need usually ". . . persists and gives rise to a certain course of overt behavior (or fantasy), which . . . changes the initiating circumstances in such a way as to bring about an end situation which stills (appeases or satisfies) the organism" (pp. 123-124). Murray identified five dimensions for distinguishing between various types of needs: (1) primary-secondary; (2) overt-covert; (3) focal-diffuse; (4) proactive-reactive; and (5) process activity, modal, and effect needs. The distinction between primary and secondary needs seems to rest on whether the need has a physiological or psychological basis; primary needs relate to bodily conditions, and secondary needs are psychological or derived needs. The overt-covert distinction refers to whether the needs are directly and overtly expressed or restrained, while the distinction between focal and diffuse needs depends on whether there is one object toward which the need is directed or a class of objects which can satisfy the need. Murray maintained that goal objects and the instrumental acts leading to their attainment both may change and, indeed, are expected to change. The proactive and reactive designations refer to whether activation of the need comes from within or outside the individual. The final distinction, which seems the most applicable to work behavior, is that between process activity (activity engaged in for its own sake), modal needs (doing something with a certain degree of excellence or quality), and effect needs (needs which lead to some desired end state or result). Although most American psychologists have emphasized effect needs, Murray held that process needs are equally important, a position shared by Gordon Allport (1937) when he proposed the concept of functional autonomy.

One of the first to apply the need-fulfillment approach to the study of job satisfaction was Schaffer (1953). Noting the lack of

success in previous investigations of job satisfaction, Schaffer attributed this failure to the "specific and empirical nature of the studies conducted" and argued for more concern with the theoretical aspects of the problem, especially the need for integration of specific findings into a "broader psychological framework." In an attempt to improve this situation, Schaffer formulated a theory, which he outlined as follows:

> Overall job satisfaction will vary directly with the extent to which those needs of an individual which can be satisfied in a job are actually satisfied; the stronger the need, the more closely will job satisfaction depend on its fulfillment. (p. 3)

In this connection, Schaffer defined 12 needs, some of which are similar to those postulated by Murray, and developed a questionnaire to measure three sets of variables: strength of each of the 12 needs, degree to which each of the 12 needs was satisfied in the present job, and overall job satisfaction. The results obtained from the administration of this questionnaire to 72 job incumbents showed that the mean satisfaction score of each person's two strongest needs correlated .58 with overall job satisfaction, a finding supporting the assumption that job satisfaction is related to need satisfaction.

Other studies have also shown relationships between reported need satisfaction and indicators of job satisfaction. For example, Vroom (1964) reports a study by Morse in which positive relationships were found between individuals' estimates of their chances for promotion and their satisfaction with promotional opportunities, and Ross and Zander (1957) found that individuals whose needs were satisfied by an organization were more likely to remain in that organization. In a study of job satisfaction among teachers, Kuhlen (1963) found only weak support for the hypothesis that satisfaction is related to the extent to which incumbents perceive their jobs as satisfying their needs. Correlations between these two variables of .25 for males and .02 for females were attributed by Kuhlen to low saliency in the teaching occupation; that is to say, the teachers did not depend upon their occupation as their major source of need gratification. In support of this conclusion, he cites evidence to show that a career is less salient among teachers than among persons in other occupations.

Thus, compared to other theoretical approaches in psychology, the need-fulfillment approach has a rather long history, and there is some evidence to support its application in the area of job satisfaction. Three need-fulfillment theories will now be considered in some detail: Maslow's "Need Hierarchy Theory," Alderfer's "E R G Theory," and the Theory of Work Adjustment.

Maslow's Need Hierarchy Theory

Maslow (1943) proposed a theory of motivation involving five levels of needs: (1) physiological, (2) safety, (3) love, (4) esteem,

and (5) self-actualization. According to Maslow, needs are related to one another in a hierarchical fashion, with self-actualization needs at the top of the hierarchy and the physiological needs at the bottom, or most basic, level. Maslow posits the idea of prepotency, which holds that the most basic unsatisfisfied need will dominate the individual's attention and prevent the emergence of the "higher" needs; that is, ". . . man lives by bread alone--when there is no bread" (p. 375). The ultimate goal of man, according to Maslow, is self-actualization. However, because of the hierarchical arrangement of needs, self-actualization can occur only after the "lower-order" needs have been reasonably well satisfied.

Several investigators have applied Maslow's concept of need hierarchy to work motivation. Porter, in a series of studies concerned with job satisfaction among managers (1961, 1962, 1963a, 1963b, 1963c), found evidence that need satisfaction varied as a function of position level. In one of these studies (1963a), Porter found that high-level managers placed more importance on self-actualization than did low-level managers. This finding is consistent with Maslow's hypothesized hierarchical arrangement of needs, if one assumes that the basic (lower-order) needs of high-level managers are more likely to be satisfied than those of low-level managers. However, because of the cross-sectional nature of Porter's work, his results did not provide conclusive support for Maslow's position; his research design allowed the possible explanation that the need patterns existed prior to the managers' promotions to high management positions. Thus, the greater importance attributed to self-actualization may have been a cause rather than a result of their promotion.

Recognizing the design deficiency in the Porter studies, Hall and Nougaim (1968) tested predictions from the Maslow model in a longitudinal study employing data gathered on management trainees over a five-year period. The specific hypotheses tested in the study were as follows:

> Hypothesis I: Within a given year, the satisfaction of a given level of needs will be positively correlated with the strength of the needs at the next higher level (static analysis).
>
> Hypothesis II: From one year to the next, changes in the satisfaction of a given level of needs will be positively correlated with changes in the strength of the needs at the next higher level (change analysis).
>
> Hypothesis III: After five years of employment, successful managers will show lower need strength and higher satisfaction in the safety needs than will their less successful colleagues. Thus, they will show higher achievement and self-actualization need strength than will the less successful group (success analysis). (p. 16)

Hall and Nougaim's results showed no substantial correlations between need satisfaction and thus no support for the notion of a need hierarchy. Based on their data, these investigators suggest an alternative formulation which they call a career stage model. According to this model, an individual moves through various stages of career development, each stage carrying with it a concern for various types of need satisfaction. These stages are described by such primary concerns as security, promotion and achievement, and self-actualization. The difference between the career stage and the hierarchy model is that career passage occurs not because of satisfaction at lower levels but

> . . . as a result of fairly regular status passages which are facilitative by both the environment (i.e., role factors) and the individual (i.e., developmental life stages). And these status passages can occur largely independent of the man's degree of perceived success in satisfying the concerns he experienced at the earlier stages. . . . (p. 29)

Hall and Nougaim's findings support this view, since both high- and low-success managers (as indicated by advancement) showed similar patterns of need changes during the five-year period of the study.

Alderfer's E.R.G. Theory

An alternative theory of human needs has been proposed by Alderfer (1969), who postulates the three need categories of Existence, Relatedness, and Growth. Although needs are assumed to be hierarchically arranged, the hierarchy is not strictly ordered, since, according to Alderfer, lower-order gratification is not a prerequisite for the emergence of the higher-order needs.

Existence needs are those which deal with material and physiological desires. Their objectives can be reduced to material substances or physical states. The satisfiers of existence needs are usually characterized by the condition that when resources are limited, one person's gain is another person's loss; that is, the food eaten by Person A is not available for Person B.

Relatedness needs concern social relationships with significant others. Basic to relatedness need satisfaction is the idea of sharing or mutuality. The satisfaction of relatedness needs may not always result in a positive affective state for all parties involved; it may include the exchange or expression of anger or hostility, as well as the exchange or expression of love or friendship.

"Growth needs include all the needs which involve a person making creative or productive effects on himself and the environment" (p. 146). The satisfaction of growth needs results from engaging in activities requiring an individual to utilize and extend his present capabilities and develop new capabilities. Involved in growth needs

is the striving on the part of the individual to become what he is capable of becoming.

The relationship of Alderfer's needs to Maslow's are depicted in Figure 3. As shown, Alderfer's Existence needs include Maslow's physiological needs plus those needs related to physical safety. Relatedness includes the needs for security and love and the need for self-esteem based upon regard for others, while the Growth needs include self-actualization and self-esteem derived from self-awareness. Alderfer states that his scheme, in contrast to Maslow's, makes no strictly-ordered hierarchical assumption. If the need categories do lie on a dimension, it might be considered a dimension of concreteness-abstractness, with Existence the most concrete and Growth the least concrete of the needs.

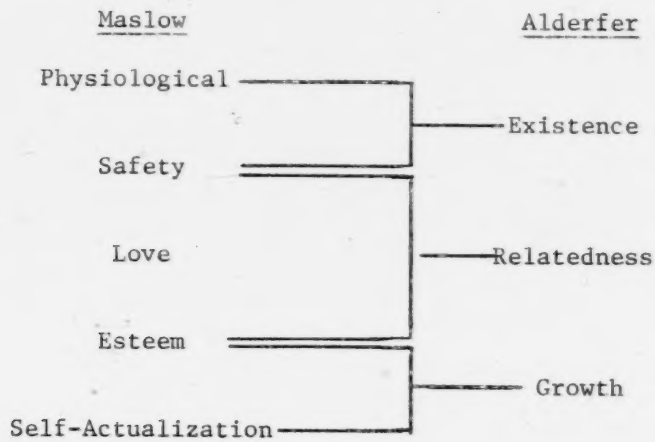

Figure 3. Comparison of Maslow and E.R.G. Need Categories

Alderfer offers seven propositions to explain the functioning of his need system:

P1. The less existence needs are satisfied, the more they will be desired.

P2. The less relatedness needs are satisfied, the more existence needs will be desired.

P3. The more existence needs are satisfied, the more relatedness needs will be desired.

P4. The less relatedness needs are satisfied, the more they will be desired.

P5. The less growth needs are satisfied, the more relatedness needs will be desired.

P6 The more relatedness needs are satisfied, the more growth needs will be desired.

P7 The more growth needs are satisfied, the more they will be desired. (1969, p. 148)

In two of these propositions (3 and 6), we see influences from Maslow's hierarchy; in two others (2 and 5), Alderfer incorporates the frustration-regression hypothesis, which states that frustration of need satisfaction at one level results in a tendency to seek satisfaction at a more concrete level. Propositions 1 and 4 derive from the simple frustration hypothesis that the more something is denied, the more it is desired. Proposition 7 is based on the results of research on level of aspiration, which have shown that when one attains a certain level of accomplishment (growth), he is likely to set a higher goal.

Alderfer notes that Propositions 2 and 5 depart from Maslow's theory by predicting an increased desire for previously satisfied lower-order needs as a result of deprivation of the next higher level of needs, whereas Maslow's model holds that satisfied needs lose their determining or organizing role. Although Proposition 7 also departs from the notion that satisfied needs are no longer motivators, it is consistent with Maslow's revised statement that "Growth is . . . a continued more or less steady upward or forward development" (1962, p. 31). Another departure from Maslow is Alderfer's classification of needs into three rather than five basic categories, which for some needs, results in different predictions from the two theories.

In a comparative study, Alderfer (1969) tested 21 hypotheses derived from the two theories. Three of these were derived exclusively from Maslow's theory, ten exclusively from the Existence-Relatedness-Growth (E R G) theory, and eight from the application of E R G Proposition 4 to a combination of E R G and Maslow needs. Although the results showed support for one of the three Maslow predictions, this support consisted of only one correlation of .15 ($p < .05$). On the other hand, eight of the ten hypotheses derived from the Alderfer model were supported by significant correlations ranging from .15 to .49, with several exceeding the .01 significance level. The results were also consistent with five of the eight cross-theory predictions, lending further support to the E R G theory (since the predictions were based on E R G Proposition 4). In essence, this last finding shows that predictions involving Maslow's needs received greater support when generated from the E R G theory than when derived from Maslow's theory.

Alderfer qualified his findings by suggesting that the negative results for the Maslow predictions might be attributable to the measures used. The measures used for the Maslow needs were less reliable than those used for the E R G needs, possibly because Alderfer relied on measures developed by others for the Maslow needs to avoid introducing his own bias into the instrument construction. Moreover, it may have been more difficult to develop operational definitions for the Maslow

needs which are less clearly distinguished than the E.R.G. needs. Even with these qualifications, however, the results of Alderfer's study, together with those of Hall and Nougaim (1968), raise some question concerning the utility of the Maslow theory as an explanatory device. Perhaps the idea that needs appear in a strictly ordered hierarchy, with higher-order needs becoming more important as lower-order needs are satisfied, is an oversimplified notion. Alderfer's results suggest that more research using a relatively complex theory (such as E.R.G.) is required.

Theory of Work Adjustment

The Work Adjustment Project at the University of Minnesota represents a systematic, long-range effort to study and explain the process through which individuals adapt to the world of work. One purpose of this project is to facilitate the practice of vocational counseling by providing conceptual and concrete tools for intervention into the process of work adjustment. The work of the project is based on the Theory of Work Adjustment (Dawis, England, and Lofquist, 1964; Dawis, Lofquist, and Weiss, 1968), which will be discussed in some detail because of its relevance to the present study.

The basic assumption underlying the Theory of Work Adjustment is the concept of balance, or fit, discussed earlier. The theory assumes that ". . . each individual seeks to achieve and maintain correspondence with his environment" (Dawis *et al.*, 1968, p. 3), where correspondence is defined in terms of the relationship between the individual personality and the work environment. Work personality is defined by work-relevant skill and need dimensions along which people vary, while the work environment is defined in terms of a set of skill-requirement and reward dimensions. An individual brings to his work environment a particular profile of skills and needs; the work environment, on the other hand, requires certain capabilities on the part of the worker and provides the worker certain rewards. According to the theory, "correspondence can be described in terms of [a] the individual fulfilling the requirements of the work environment, and [b] the work environment fulfilling the requirements of the individual" (Dawis *et al.*, 1968, p. 3). The terms used for these two conditions are (a) "satisfactoriness" and (b) "satisfaction." Thus, under the Theory of Work Adjustment, the personality of the individual and the characteristics of the work environment are described on comparable dimensions, thereby allowing direct estimates of individual-environmental congruence.

With the above concepts and assumptions identified, the theory may be stated formally in terms of the following propositions and corollaries:

> Proposition I. An individual's work adjustment at any point in time is indicated by his concurrent levels of satisfactoriness and satisfaction.

Proposition II. Satisfactoriness is a function of the correspondence between an individual's abilities and the ability requirements of the work environment, provided that the individual's needs correspond with the reinforcer system of the work environment.

> Corollary IIa. Knowledge of an individual's abilities and of his satisfactoriness permits the determination of the effective ability requirements of the work environment.
>
> Corollary IIb. Knowledge of the ability requirements of the work environment and of an individual's satisfactoriness permits the inference of an individual's abilities.

Proposition III. Satisfaction is a function of the correspondence between the reinforcer system of the work environment and the individual's needs, provided that the individual's abilities correspond with the ability requirements of the work environment.

> Corollary IIIa. Knowledge of an individual's needs and of his satisfaction permits the determination of the effective reinforcer system of the work environment of the individual.
>
> Corollary IIIb. Knowledge of the reinforcer system of the work environment and of an individual's satisfaction permits the inference of an individual's needs.

Proposition IV. Satisfaction moderates the functional relationship between satisfactoriness and ability-requirement correspondence.

Proposition V. Satisfactoriness moderates the functional relationship between satisfaction and need-reinforcer correspondence.

Proposition VI. The probability of an individual being forced out of the work environment is inversely related to his satisfactoriness.

Proposition VII. The probability of an individual voluntarily leaving the work environment is inversely related to his satisfaction.

Combining Propositions VI and VII, we have:

Proposition VIII. Tenure is a joint function of satisfactoriness and satisfaction.

Given Propositions II, III, and VIII, this corollary follows:

Corollary VIIIa. Tenure is a function of ability-requirement and need-reinforcer correspondence.

Proposition IX. Work personality-work environment correspondence increases as a function of tenure. (1968, pp. 9-10)

A good deal of research has been conducted to test various aspects of the Theory of Work Adjustment. Of particular interest here, however, is the research pertaining to Proposition III, which states that "Satisfaction is a function of the correspondence between the reinforcer system of the work environment and the individual's needs, provided that the individual's abilities correspond with the ability requirements of the work environment" (Dawis, Lofquist, and Weiss, 1968, p. 9). This proposition was first tested in a study of the construct validity of the Minnesota Importance Questionnaire (MIQ) (Weiss, Dawis, England, and Lofquist, 1964b). In this study, five judges rated 19 jobs in terms of the reinforcements provided by each job, and the MIQ was administered to a sample of incumbents in these jobs. The finding that there were more "high-need" than "low-need" individuals in "high-reinforcer" jobs and that "high-need" individuals in "high-reinforcer" jobs expressed greater satisfaction was offered as support for Proposition III.

Another test of Proposition III was reported by Golden and Weiss (1968) who, instead of having outside judges rate jobs in terms of the reinforcements provided, asked job incumbents themselves to indicate the extent to which specified reinforcements were provided by their jobs. Again, the results supported Proposition III: mean satisfaction scores were higher for a "high-need" group in a "high-reinforcer" job environment than for a "high-need" group in a "low-reinforcer" environment.

Still another test of Proposition III was conducted by Betz (1969), who administered measures of needs, job reinforcers, and satisfaction to three groups of store employees. Five indices of need-reinforcer correspondence were calculated: (1) Spearman's rho, (2) the D-statistic, and (3) three "correspondence band" measures. The three correspondence band indices were computed by taking the proportion of the 20 pairs of scales for which the MIQ score fell within (a) ±1 s.d. from the mean occupational reinforcer profile (ORP), (b) ±2 s.d. from the mean ORP, and (c) within the first and third quartile values of the mean ORP. When each of the five correspondence measures was correlated with overall satisfaction, the results showed that the correspondence bands had the highest correlations with satisfaction. The band correlations were significant for two of the three work groups, with a high of .37 for one group and .45 for the other. Betz interpreted these results as providing additional support for Proposition III.

On the basis of the studies reviewed, Proposition III appears to have some substance; a relationship was demonstrated between satisfaction and need-reinforcer congruence in three studies employing different procedures, measuring devices, and samples.

The Concept of Vocational Interests

The vocational interest concept has been the subject of a large number of studies over the past few decades. Much has been written concerning what interests are, how they develop, and how they relate to other variables (Strong, 1943; Super and Crites, 1962). Yet, despite all the attention given to the interest concept, its exact nature remains hazy; there is no adequate theoretical treatment of the concept, and writers cannot agree concerning its origin, definition, or utility. Nevertheless, it continues to be used both in common language and in research.

The present paper will not undertake a comprehensive survey of the interest literature, but instead will attempt to define the concept for purposes of this study and relate it to the Theory of Work Adjustment. Only studies that are relevant to this purpose will be reviewed. For the present study, interests will be defined as preferences for classes of work-related activities, i.e., tendencies to approach or avoid specified classes of activities. This operationally oriented definition seems reasonable, since it is through asking individuals to choose between various types of work activities that vocational interests are usually measured.

As mentioned earlier, no adequate theory of interests exists. Although it is frequently mentioned that interests have motivational connotations, none of the work motivation theories discussed has dealt explicitly with the interest concept. The only exception--and this is only a partial exception--has been the Theory of Work Adjustment. Lofquist and Dawis (1969) acknowledged the interest concept, tentatively related it to abilities and needs, and then decided that it was not one of the primary sets of variables with which they were concerned. Their rationale is reflected in the following statement.

> Interests are seen, then, as deriving from the interaction of needs and abilities (or, more basically, from the interaction of reinforcement values and skills). The stability of interests is contingent upon the stabilization of an individual's set of needs and abilities (that is, upon his reaching psychological maturity) and can be observed in most people with the attainment of physical maturity. (pp. 31-32)

According to this view, then, given reasonable estimates of a person's abilities and needs as well as the rules for interrelating the two, it should be possible to predict his interests. Super and Crites (1962)

reviewed much of the literature pertaining to this question and concluded that the evidence pointed to some rather small relationships between interests and needs and between interests and abilities.

Subsequent to the Super and Crites review, however, Thorndike and his associates (Thorndike, Weiss, and Dawis, 1968a; 1968b) conducted two studies that might be considered something of a breakthrough in the area of interest-need relationships. In the first study, the Strong Vocational Interest Blank (SVIB) and the Minnesota Importance Questionnaire (MIQ) were administered to 269 male college students and 262 male vocational rehabilitation applicants. For each of the two samples, a canonical correlation was then computed between the SVIB and MIQ scales. These correlations were .79 and .74, indicating a direct relationship between the Strong interests and the MIQ needs. In the second study (Thorndike et al., 1968b), the MIQ and the Minnesota Vocational Interest Inventory (MVII) were administered to a total group of 505 male vocational rehabilitation applicants, which was split into two random samples of 246 and 259. The canonical correlations between the MIQ and MVII scales were .65 and .62 for the two samples; and when the weights calculated for Group 2 were applied to Group 1 and vice versa (in a double cross-validation design), two significant correlations of .38 were obtained.

Perhaps the reason that prior studies of the relationships between interests and needs resulted in lower correlations than those obtained by Thorndike et al. can be found in the fact that the Thorndike studies were the first to use multivariate methods to investigate this relationship. To the writers' knowledge, no analogous multivariate studies have been carried out to determine relationships between interests and abilities. When such studies are conducted, perhaps relationships of a similar magnitude will be found.

At any rate, the results of the Thorndike studies are consistent with the notion that interests and needs are related, and point to the potential value of including the interest concept in future explanations of job satisfaction.

The inclusion of interests as additional variables in a theory of work adjustment would broaden the concepts of work personality and work environment through a consideration of work activities as reinforcers. This would lead to a restatement of Proposition III as follows: Satisfaction is a function of the correspondence between the reinforcer system of the work environment, including the actual work activities themselves, and the individual's needs and interests, provided that the individual's abilities correspond with the ability requirements of the work environment.

Assumptions Relevant to the Present Study

The rationale for the present study involved at least three assumptions:

(1) Individuals can be characterized by a stable and quantifiable set of dimensions in the affective domain (e.g., interest and need scales).

(2) Jobs can be characterized in terms of stable and quantifiable sets of (a) work dimensions representing various types of activities and conditions and (b) attribute-requirement dimensions corresponding to defined human characteristics.

(3) Individuals strive to establish and maintain congruence between their personal characteristics and the characteristics of their work environment.

Interests and needs were the affective variables selected under the first assumption of this study. Needs were defined as preferences for (tendencies to approach or avoid) various classes of conditions and outcomes associated with work situations, and were measured by the scales of the Minnesota Importance Questionnaire (described earlier). Interests were similarly defined as preferences for various classes of work activities. The Ohio Vocational Interest Survey (OVIS), which was selected for use in the present study, contains items based on actual work activities as described in the Dictionary of Occupational Titles (U. S. Department of Labor, 1965). The 24 scales of the OVIS correspond to groups of occupations judged to have similar human trait requirements.

A recent review of research in the area of ergometrics (Cunningham, 1971) summarizes the evidence for the second assumption. This review surveys a number of approaches to the problem of defining and measuring work variables. One very promising approach was developed by E. J. McCormick and his associates in a long-range research program conducted at Purdue University. This program involved the development and testing of a series of job-analysis inventories, culminating in the Position Analysis Questionnaire (PAQ) (Cunningham and McCormick, 1964; Gordon and McCormick, 1963; Jeanneret and McCormick, 1969; McCormick, Cunningham, and Gordon, 1967; McCormick, Jeanneret, and Mecham, 1969, 1972; Palmer and McCormick, 1961). In one study, a large sample of jobs was rated on the PAQ work elements (items), and the data were used as a basis for intercorrelating and factor analyzing the elements. The resulting factors were both meaningful and replicable, and were interpreted as basic dimensions which could be used to describe the general population of jobs. The results of the PAQ research and other studies (e.g., Ricco-bono and Cunningham, 1971b) provide evidence that stable work dimensions can be derived through quantitative job-analysis procedures.

The third assumption of this study comes directly from the Theory of Work Adjustment (Dawis, Lofquist, and Weiss, 1968). As noted in the preceding review, the most direct support for this assumption is found in a study by Weiss et al. (1964) showing that more people with high scores on specified MIQ needs were employed in jobs rated high on reinforcement for those needs than in jobs rated low on such reinforcement, while people scoring low on those needs tended to be in jobs rated low on corresponding reinforcement.

HYPOTHESES

As noted earlier, the present study had two major purposes: (1) to determine if OAI-derived occupational clusters were meaningful (i.e., discriminable) in terms of measured human behavioral potentials in the affective domain (i.e., interest and need scores) and (2) to validate the OAI interest- and need-requirement[2] estimates for occupations. The specific objectives of the research pertaining to these purposes can be stated as hypotheses to be tested. These hypotheses and their underlying rationale are discussed below.

Discrimination Among Occupational Clusters

There are many potential ways of clustering occupations. Any attempt to evaluate a particular clustering approach must first identify the purpose of that approach. One purpose of the OAI project was to develop a procedure for comparing and grouping occupations that would yield clusters which were meaningful in terms of their human behavioral requirements (Cunningham et al., 1971). For purposes of the present study, it was decided that the most practical and useful variables for reflecting these behavioral requirements were to be found among existing measures of human attributes (or behavioral potentials)--i.e., among existing tests and inventories. The particular human attributes selected for this study were interests and needs. In this context, the "meaningfulness," or validity, of occupational clusters relates to whether or not they are discriminable in terms of the interest and need scores of incumbents in the occupations forming the clusters.

It is assumed (Assumption Three, p. 26) that individuals attempt to establish and maintain congruence between the work environment and their particular interests and needs. Thus, the average interest and need profiles of a representative sample of workers with some reasonable tenure in a given occupation might be assumed to represent the appropriate interest and need profiles for that occupation; that is, their interest and need profiles should parallel the reinforcement profiles of the occupation. Furthermore, occupations with similar characteristics and requirements might be expected to have similar interest and need profiles based upon the scores of representative groups of incumbents, and occupations with dissimilar characteristics and requirements might be expected to have dissimilar interest and need profiles. Following this rationale, one might further reason that clusters formed by occupations with similar OAI work-dimension profiles should differ significantly in

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[2]See Footnote 1, p. 6.

terms of the interest and need scores of persons employed in these clusters--that is, if the clusters are meaningful in terms of the measured interests and needs. Hypothesis One is based on this rationale and can be stated as follows: Mean Ohio Vocational Interest Survey (OVIS) scores and Minnesota Importance Questionnaire (MIQ) need scores of job incumbents will differ significantly across OAI-derived occupational clusters.

Another set of criterion variables was obtained from the work of Campbell et al (1968), who have developed a set of 22 basic scales for the Strong Vocational Interest Blank (SVIB). Since the items were unchanged from the standard SVIB, it was possible to rescore the SVIB data already gathered from incumbents in a sample of occupations and obtain average basic scale scores for those occupations. The availability of these data made possible a second test of the OAI clustering procedure. The reasoning behind this test is the same as that for Hypothesis One; namely, if the OAI-derived clusters are meaningful in terms of measured interests, then mean interest scores of incumbents should differ across the clusters. Accordingly, Hypothesis Two states that: Mean SVIB basic scale scores of incumbents will differ significantly across OAI-derived clusters.

A third test of the OAI clustering procedure also used the Strong Vocational Interest Blank. For this test it was reasoned that if OAI-derived clusters are meaningful in terms of SVIB interests, then occupations within a given OAI cluster should be more similar to each other in terms of their SVIB item profiles than to occupations outside that cluster. A measure of similarity between pairs of occupations can be derived from the appropriate occupational scoring keys of the SVIB. If two occupations are considered "similar" on some analytic basis, such as OAI analysis, then one would expect that the SVIB item-scoring keys for the two occupations (which are based on the item responses of persons employed in the occupations) would be more similar to each other than to the scoring keys for other "less similar" occupations. Thus, Hypothesis Three states that: Mean distance scores between pairs of occupations, based on SVIB occupational item-key profiles, will be significantly smaller when computed among occupations within OAI-derived clusters than when computed among occupations from different OAI clusters.

Validation of OAI Interest- and Need-Requirement Estimates

The remaining hypotheses pertain to the second purpose of this study, i.e., to test the validity of the OAI interest- and need-requirement estimates for occupations. As mentioned previously, it might be deduced from Assumption Three that the average interest and need profiles of a representative sample of workers in a given occupation provide reasonable estimates of the appropriate interest and need profiles for that occupation. This latter assumption would justify using the average interest

and need scores of workers in selected occupations as criteria for the validation of the OAI interest- and need-requirement estimates for those occupations. Accordingly, Hypothesis Four states that: OAI-derived estimates of the interest- and need-requirements of occupations will correlate significantly with the corresponding average OVIS interest scores and MIQ need scores of incumbents in those occupations.

Another, more rigorous, set of criterion variables used in this study consisted of the scores of job incumbents on the Minnesota Satisfaction Questionnaire (MSQ). As noted, Assumption Three states that individuals strive to maintain congruence between their own characteristics (e.g., needs) and the characteristics of their work environment (e.g., reinforcers); and Proposition Three of the Theory of Work Adjustment holds that satisfaction is an indicator of the extent to which an individual has achieved this congruence. Based on these two assumptions, one might predict a significant relationship between need-reinforcer congruence and job satisfaction, given that the need, reinforcer, and satisfaction measures are valid. If it is assumed that the need and satisfaction measures are indeed valid, then substantiation of the predicted relationship would provide support for the validity of the reinforcer measure. Accordingly, the OAI need-requirement (reinforcer)[3] estimates for occupations were tested against the MSQ (satisfaction) scores of job incumbents who were either high or low on the corresponding MIQ needs.

A two-by-two factorial design was used for this test, with OAI need-requirement scores for occupations serving as one independent variable, MIQ need scores of job incumbents as the second independent variable, and MSQ (satisfaction) scores of incumbents as the dependent variable. An analysis of variance was applied separately under this design for each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ satisfaction scale. In each case, incumbents were divided into high- and low-scoring groups on a specified MIQ need, occupations were divided into high and low groups on the corresponding OAI need-requirement estimate, and scores of incumbents on the appropriate MSQ scale were entered in the cells of the two-by-two ANOVA table.

It was reasoned that an individual who is both high on a particular need and employed in an occupation that is high on the reinforcer dimension for that need is in a congruent (or satisfying) situation. Conversely, an individual who is high on a particular need but employed in an occupation that is low on reinforcement for that need is in an

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[3]As mentioned previously, the term "need-reinforcer" could be substituted for the term "need-requirement," since an OAI need-requirement estimate for an occupation is interpreted as an index of the extent to which the occupation provides reinforcement for the specified need. The term "reinforcer," as used here, is borrowed from the Theory of Work Adjustment (Dawis et al., 1964).

incongruent (or unsatisfying) situation. For individuals who are low on a specified need, the reinforcement characteristics of the work environment in relation to that need dimension should have little effect upon satisfaction, although it might be speculated that satisfaction would be slightly higher in the high-reinforcer situation, particularly in the case of the lower-order (or hygiene) needs. Hypothesis Five states that there will be a systematic relationship between the OAI need-requirement (reinforcer) estimates for occupations and the MSQ satisfaction scores of incumbents in these occupations, and that this relationship will be moderated by the incumbents' MIQ need scores. This hypothesis can be broken down into three specific predictions: (a) there will be a significant OAI need-reinforcer (requirement) main effect; (b) there will be a significant interaction between the MIQ need and OAI need-reinforcer factors; and (c) the high-need, high-reinforcer group will have significantly higher satisfaction scores than the high-need, low-reinforcer group.

In addition to an examination of satisfaction on a need-by-need basis, an attempt was made to relate overall (or summed) satisfaction to the degree of congruence between the worker's MIQ need profile and the estimated reinforcer profile for his occupation. Essentially, the congruence measure consisted of the sum of a set of a priori weights associated with the distances (and their directions) between the worker and his occupation on selected MIQ dimensions (see pp. 63 and 68). By this procedure, a separate congruence measure was computed for each worker for both "extrinsic" and "intrinsic" needs, and an overall congruence index was obtained by adding these two separate measures. Workers were ranked on each of the three congruence measures, and the upper and lower quartiles were established for each set of measures. Statistical comparisons on the dependent variable of satisfaction were then performed between the highest and lowest 25 percent groups on congruence; F values were computed between groups formed from each of the three congruence measures, using a corresponding dependent variable measure of extrinsic, intrinsic, or overall satisfaction (i.e., one F value was computed for each pair of groups). The statistical comparisons served to test Hypothesis Six, which states that general satisfaction, as measured by the MSQ, will be positively related to the degree of congruence between the worker's MIQ need profile and the OAI need-reinforcer profile of his occupation.

The last prediction, Hypothesis Seven, involves a direct comparison between the OAI need-requirement estimates for a sample of occupations and the corresponding Occupational Reinforcer Profiles (ORP's) of the same occupations obtained from the published results of the Minnesota Work Adjustment Project (Borgen et al., 1968). Since one type of evidence for the validity of a measure is the extent to which that measure agrees with another measure of the same construct, it was decided that it would be useful to examine the relationships between the OAI and the Work Adjustment Project reinforcer estimates. Specifically, Hypothesis Seven states that: The OAI need-requirement estimates for a sample of occupations will correlate significantly with the corresponding ORP estimates of the Minnesota Work Adjustment Project.

Summary of Hypotheses Tested

In summary, this study was designed to test the following hypotheses:

(1) Mean Ohio Vocational Interest Survey (OVIS) scores and Minnesota Importance Questionnaire (MIQ) need scores of job incumbents will differ significantly across OAI-derived occupational clusters.

(2) Mean SVIB basic scale scores of job incumbents will differ significantly across OAI-derived clusters.

(3) Mean distance scores between pairs of occupations, based on SVIB occupational item-key profiles, will be significantly smaller when computed among occupations within OAI-derived clusters than when computed among occupations from different OAI clusters.

(4) OAI-derived estimates of the interest- and need-requirements of occupations will correlate significantly with the corresponding average OVIS interest scores and MIQ need scores of incumbents in those occupations.

(5) There will be a systematic relationship between the OAI need-requirement (reinforcer) estimates for occupations and the MSQ satisfaction scores of incumbents in these occupations, and that relationship will be moderated by the incumbents' MIQ need scores. The specific predictions from this hypothesis are as follows: (a) there will be a significant OAI need-reinforcer (requirement) main effect; (b) there will be a significant interaction between the MIQ need and OAI need-reinforcer factors; and (c) the high-need, high-reinforcer group will have significantly higher satisfaction scores than the high-need, low-reinforcer group.

(6) General satisfaction, as measured by the MSQ, will be positively related to the degree of congruence between the worker's MIQ need profile and the OAI need-reinforcer profile of his occupation.

(7) The OAI need-requirement estimates for a sample of occupations will correlate significantly with the corresponding ORP estimates from the Minnesota Work Adjustment Project.

SAMPLES, VARIABLES, AND DATA COLLECTION PROCEDURES

Occupational Samples

The present study included three separate samples of jobs, labeled the (1) test sample, (2) Strong sample, and (3) ORP sample. A list of the jobs comprising each of these three samples appears in Appendix A.

Test Sample

The test sample, consisting of 47 occupations, is so labeled because it was for these occupations that test data were actually collected in the present study. The occupations comprising this sample were selected according to the following criteria:

(1) It was possible to obtain test scores from incumbents in the occupations.

(2) Adequate written descriptions of the occupations were available.

(3) The distribution of the occupational sample would be roughly proportional to the numbers of people in the work force employed in the 11 major U. S. Bureau of the Census categories (Matthews, 1968).

Strong Sample

The Strong sample included 49 occupations for which there are item-key profiles for males. There are item-key profiles for males for 51 different occupations, but two of these were eliminated because suitable written descriptions could not be located for these occupations.

ORP Sample

The ORP sample consists of 48 occupations for which ratings had been obtained on the OAI and for which there were published Occupational Reinforcer Patterns from the Minnesota Work Adjustment Project (Borgen et al., 1968).

Independent Variables

Test Sample

Two groups of independent variables were obtained for each of the occupations in the test sample. The first group consisted of three sets of OAI work-dimension scores derived from three different sets of factor analyses. The second group of independent variables consisted of OAI interest- and need-requirement estimates for the 47 occupations in the test sample. The procedures for deriving these variables are diagramed in Appendix B.

The first group of independent variables, the factor scores, were derived in previous research by the Ergometric Project. Two of the three sets of factors were obtained by factor analyzing the items (work elements) of the OAI. In one case OAI items were intercorrelated on the basis of ratings of a sample of 822 occupations (Riccobono and Cunningham, 1971a, 1971b). In a second case the items were intercorrelated on the basis of average ratings on a set of 103 human attributes (the list of attributes in the Attribute Requirement Inventory) and then factor analyzed (Neeb, Cunningham, and Pass, 1971). The third set of factors was derived from a second-order factor analysis of the intercorrelations between factors derived from job ratings; that is, the factors derived from ratings of occupations on the OAI were intercorrelated and factor analyzed. These three sets of factor scores will hereafter be referred to, respectively, as: job factor scores, attribute factor scores, and second-order factor scores. Figure 4 depicts the three factor score matrices.

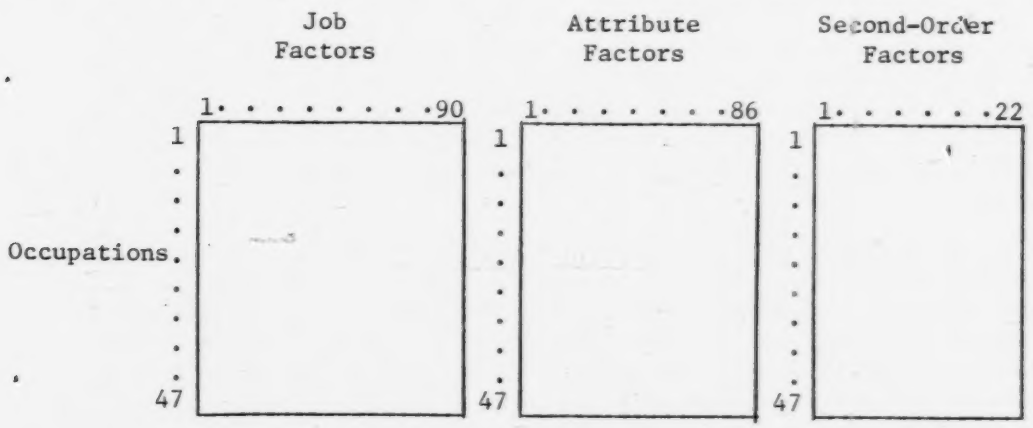

Figure 4. Matrices of Factor Scores for the 47 Occupations in the Test Sample

The second group of independent variables consisted of OAI-derived attribute-requirement estimates for the occupations in the test sample on 24 vocational interests and 20 needs. In the case of interests and needs, an OAI "attribute-requirement" estimate for an occupation indicates the degree of compatibility between that occupation and the specified interest or need; that is, the extent to which the occupation reinforces the interest or need. As mentioned previously, an earlier study was conducted in which attribute-requirement weights were derived for each of the OAI work elements (items) on each of the 103 human attributes defined in the Attribute Requirement Inventory (Neeb et al., 1971). In the present study, these attribute-requirement weights for OAI items provided the basis for obtaining attribute-requirement estimates for 822 occupations rated on the OAI.

Three different procedures were used for deriving these estimates, two involving the use of the OAI factor scores for occupations and a third involving the direct use of OAI item ratings of occupations. (These procedures are diagramed in Appendix B.) Since each OAI item had a profile of attribute-requirement weights, it was possible to derive attribute-requirement weights for each of the OAI factors (work dimensions). This was done separately for each factor on each of the 103 ARI attributes by computing a weighted average based on the attribute weights for the significant OAI items in a factor multiplied by the loadings (transformed to Fisher's z's) of the items on that factor. An attribute-requirement estimate for an occupation could then be computed by multiplying the sum of the cross-products of the occupation's scores on the OAI factors by the weights of the factors on the specified attribute. (These summed cross-products were converted to standard scores for each attribute, based on a sample of 822 occupations.) Since this procedure was followed with both the job factors and the attribute factors (described previously), two estimated attribute-requirement profiles (each based on the 103 ARI attributes) were obtained for each of 822 occupations. In addition, a third attribute-requirement profile was obtained for each occupation by multiplying the sum of the cross-products of the occupation's OAI item ratings by the requirement weights of the items on a specified attribute. (These summed cross-products were also converted to standard scores based on the sample of 822 occupations.)

Thus, by three different procedures, requirement profiles were obtained for 822 occupations on 103 human attributes. Of particular interest for this discussion, however, are the OAI interest- and need-requirement estimates for the 47 occupations in the test sample. For reasons explained in a later section of this paper, only the attribute-requirement estimates derived directly from OAI item ratings (i.e., by the third procedure) were used as independent variables in this study. These variables are depicted in Figure 5.

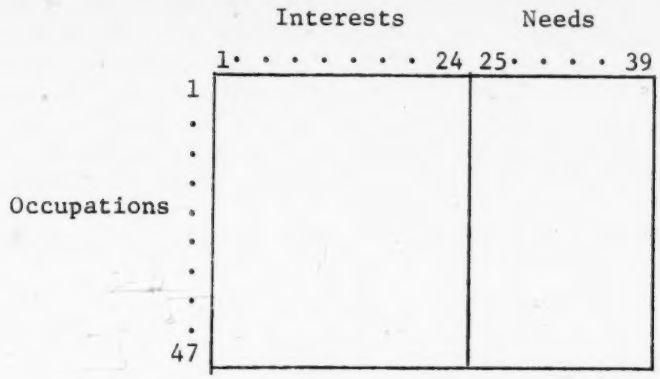

Figure 5. Matrix of OAI Interest- and Need-Requirement Estimates for the 47 Occupations in the Test Sample

Strong Sample

For the Strong sample there were two sets of independent variables, scores of occupations on job factors and on attribute factors. Second-order factor scores were not used with the occupations in the Strong sample. Figure 6 depicts the independent variable matrices for the Strong sample. The elements in each of these matrices are factor scores for the 49 occupations in the Strong sample.

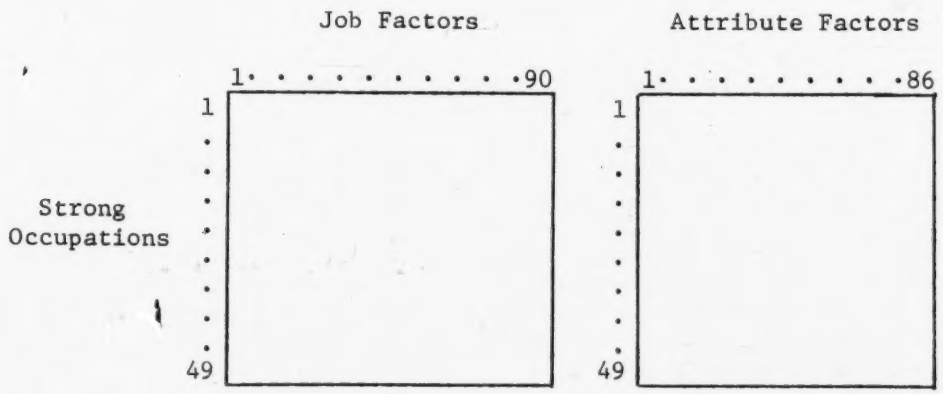

Figure 6. Matrices of Factor Scores for the 49 Occupations in the Strong Sample

ORP Sample

The Occupational Reinforcer Profile (ORP) sample included 48 occupations that had been rated with the OAI and for which there were also published occupational reinforcer profiles (Borgen et al., 1968). The

independent variables for this occupational sample consisted of OAI attribute-requirement estimates on 15 needs defined in the Attribute Requirement Inventory (Neeb et al., 1971). (As mentioned previously, an OAI "need-requirement" estimate for an occupation is an indication of the extent to which the occupation reinforces that need.) The published ORP's describe occupational reinforcers on 21 dimensions; the OAI procedure yields reliable estimates for 15 of these 21 dimensions.[4]

The independent variable matrix for the ORP sample is depicted in Figure 7.

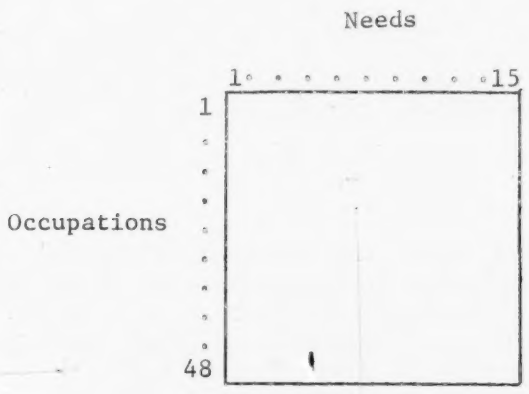

Figure 7. Matrix of OAI Need-Requirement (Reinforcer) Estimates for the 48 Occupations in the ORP Sample

Data Collection Procedures

The data collection for this project was limited to the occupations comprising the test sample. The procedure used to select occupations for this sample was described earlier. The data collection procedure involved locating incumbents in the appropriate occupations, obtaining from either employers or individuals a commitment to participate in the research, administering three questionnaires, scoring the questionnaire responses, and reporting the results back to participating organizations or individuals.

Job Incumbents

The first step in obtaining job incumbents for the study was to identify organizations that employed individuals in the occupations in

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[4]Those scales not included were Company Policies and Practices, Co-Workers, Moral Values, Supervision--Technical, and Supervision--Human Relations.

the test sample. This information was obtained from such sources as trade and professional associations, Chamber of Commerce information, the U. S. Employment Service, and the telephone directory.

It was then necessary to contact and visit the organizations identified to discuss the costs and benefits to the organization of participation in the research. The visit was also necessary to verify that the organization description of the job or jobs concerned agreed sufficiently with the occupation description that had been rated on the OAI. Job titles were insufficient for this purpose, since there was considerable variation in job title from place to place, even though the descriptions might be very similar.

Organizations that agreed to participate were asked to select incumbents on the basis of three criteria: (1) the individuals had worked in the particular job for at least one year, (2) the individuals were willing to participate, and (3) the individuals had at least an eighth-grade reading level. The first criterion was required to meet the assumption that the incumbents sampled were successful on their job. According to Proposition VIII of the Theory of Work Adjustment, this should ensure that the incumbents were in at least a minimum state of correspondence with the work environment in terms of their abilities and needs. The second criterion was adopted in an attempt to increase response accuracy. Finally, the third criterion was needed to ensure that the incumbents could read and understand the questionnaire's instructions and items.

For some occupations, such as tobacco grower, real estate agent, and wood technologist, incumbents were contacted on an individual basis by mail. A letter describing the project was mailed, and individuals were asked to indicate on an enclosed post card whether they were willing to participate in the research. Those who indicated they would be willing to participate received the questionnaires by mail.

The sample of incumbents obtained included 916 individuals representing 47 different occupations. The number of incumbents per occupation ranged from 3 to 47, with a mean number of 19.5. Appendix C presents a breakdown of the 47 occupations by U. S. Bureau of the Census categories.

With the exception of two occupations, the incumbents were drawn exclusively from North Carolina. For one of those occupations, elementary teacher, 80 percent of the individuals worked in west central Florida. For the other occupation, wood technologist, roughly 30 percent worked in scattered locations outside North Carolina. North Carolina can be divided into three geographical regions: west, Piedmont, and east. The study drew incumbents from these three areas approximately as follows: west, 7 percent; Piedmont, 90 percent; east, 3 percent. Even though the Piedmont is the most heavily industrialized of the three regions, this study drew disproportionately from this region.

Instruments

Three inventories and a locally developed demographic questionnaire were administered: the Ohio Vocational Interest Survey, the Minnesota Importance Questionnaire, the Minnesota Satisfaction Questionnaire, and the Worker Information Questionnaire. The Worker Information Questionnaire appears in Appendix D.

The Ohio Vocational Interest Survey (OVIS) was developed in accordance with a conceptual framework used in the Dictionary of Occupational Titles (U. S. Department of Labor, 1965). The instrument is composed of 24 scales derived from the 114 worker-trait groups identified in the DOT. These scales provide easy access to the DOT, since each of the scales is based on one or more of the worker-trait groups. Its relationship to the DOT makes the instrument valuable for counseling purposes.

The psychometric data available on the OVIS indicate that it has a reasonable degree of measurement precision. Although the instrument is new and no long-range reliability studies are available, the reliability indices that are available are of acceptable size. Split-half reliabilities averaged around .90 on a developmental form of the test, while test-retest reliabilities with a 15-day delay averaged around .80 (D'Costa, 1969).

Evidence of the validity of the OVIS is of two types. Its content validity is based on the fact that the scales of the inventory were derived from the worker-trait groups in the DOT. Therefore, if the DOT adequately represents the general population of jobs, the OVIS should also be adequate in that respect. A demonstration of construct validity is found in a study reported by D'Costa (1969). In this study, the OVIS was administered to 350 "successful and satisfied" students enrolled in six vocational education areas, and the resulting scores were subjected to multiple discriminate analysis in an effort to test the ability of the OVIS scales to discriminate among the vocational groups. The results showed that "the groups representing the six vocational education areas were significantly different in their OVIS scale scores and that discriminant functions derived from this study were significantly successful in classifying an independent sample of students" (D'Costa, 1969, p. 9).

The second instrument used in this study is a measure of needs, the Minnesota Importance Questionnaire (MIQ). This instrument was developed as part of the research of the Work Adjustment Project (Weiss, Dawis, Lofquist, and England, 1966). The MIQ has undergone several revisions; the form used in the present study contains 210 items and yields 20 need-scale scores. The MIQ uses two scaling procedures to arrive at a measure of an individual's needs: comparative judgment and absolute judgment. Each of 20 items is compared with every other item in a complete set of pair comparisons. Following this, the individual is asked to respond to each item in an absolute sense, yielding the individual's "zero-point."

The reliability of the MIQ has been estimated in four ways: (1) internal consistency of scales, (2) internal consistency of total profiles, (3) stability of scale scores over time, and (4) stability of MIQ profiles over time. Hoyt's internal consistency reliability coefficients were computed separately for each of the 20 scales for each of nine groups of subjects. Median scale internal consistency coefficients ranged from .77 to .81 (Hendel and Weiss, 1970). The profile internal consistency is indicated by the total circular triads score (TCT). This score represents the amount of inconsistency within an individual profile. Kauppi and Weiss (1969) found this score to be the most efficient predictor of inventory validity of any studied. The same study also showed that the TCT is predictive of profile instability over time. Hendel and Weiss (1970) investigated the stability of scale scores over time. The range of scale stability coefficients for the longest interval studies (ten months) was from .46 to .79, with a median of .53. The lowest reported scale stability coefficient was .19 for a nine-month interval, and the highest was .93 for an immediate retest. In the same study, Hendel and Weiss dealt with the question of profile stability by computing test-retest profile correlations for periods ranging from immediate retesting to ten months. The median coefficients ranged from .95 for the immediate retest to .71 for a four-month interval. For a ten-month test-retest interval, the profile correlations ranged from .58 to .97 with a median of .87. It would appear, then, that the reliability of the MIQ, although at times low, is at least adequate for research purposes. The demonstrated relationship between TCT scores and profile instability makes it possible to identify those profiles which are likely to be invalid and which, therefore, would not be expected to remain stable over time.

The validity of the MIQ has been supported in several studies. For example, Weiss et al. (1964b) found the MIQ useful in discriminating between these groups: (1) disabled versus non-disabled, (2) persons with different occupational status, and (3) persons with differing employment status. Furthermore, several previously reviewed studies offer evidence for the ability of the MIQ to predict job satisfaction in accordance with predictions from the Theory of Work Adjustment (Weiss et al., 1964a, 1967; Golden and Weiss, 1968; and Betz, 1969).

The third instrument used in the study was a measure of job satisfaction, the Minnesota Satisfaction Questionnaire (MSQ). This instrument consists of 100 items and yields scores on the same 20 dimensions as the MIQ. In addition, it is possible to derive a total satisfaction score by drawing one item from each of the 20 scales.

Reliability data for the MSQ are based on 27 norm groups. The median Hoyt internal consistency coefficients ranged from .93 to .78 for the 20 scales; 83 percent of these coefficients exceeded .80, while 2.5 percent were below .70. The stability of the scores was estimated on two samples and for two time intervals, one week and one year. Test-retest (stability) correlations for the 20 scales over the one-week interval ranged from .66 to .91, with the median at .83. The one-week

stability coefficient for the General Satisfaction Scale was .89. For the one-year interval the coefficients for the 20 scales ranged from .35 to .71, with a median of .71, and the coefficient for the General Satisfaction Scale was .70.

Evidence supporting the validity of the MSQ is of two types. First, the instrument has performed according to the predictions of the Theory of Work Adjustment in discriminating between satisfied and unsatisfied workers. Evidence of construct validity was found for ten of the 20 scales (Weiss et al., 1964b). The second type of validity for the MSQ was its demonstrated ability to differentiate among occupational groups (Weiss et al., 1967). Data from 25 occupational groups were analyzed by a one-way analysis of variance and by Bartlett's test. The finding of significant differences in the means and variances of each MSQ scale across the occupational groups was taken as evidence for the validity of the instrument.

Administration

The administration of the questionnaires was accomplished in one of three ways. The preferred method, supervised testing, was employed for approximately 80 percent of the data. This method involved group administration of the questionnaires to job incumbents during their paid work time. Both of the other methods involved unsupervised administration of the questionnaires. In one case (for approximately five percent of the data) incumbents were given the questionnaires and the instructions in person, then were left to complete the questionnaires unsupervised. The remaining 15 percent of the data were obtained by the least desirable method, distribution by mail. With this method there was no opportunity for face-to-face contact between incumbents and the test administrator. With three exceptions, incumbents in all occupations were administered all four questionnaires. For the occupation of Psychologist, graduate students at the master's level or above were used; thus, for these individuals, the job satisfaction inventory was not relevant. For Patrolman and Tobacco Grower, only the OVIS was administered.

The same instructions were used for each of the three methods of administration, except for the three occupations mentioned above where certain irrelevant information was omitted. These instructions appear in Appendix E. The instructions were designed to convey the purpose of the research in such a way that incumbents would feel free to respond candidly to the items. Each incumbent was assured that his anonymity was protected and that his responses would not affect him in his job. In addition, incumbents were informed that they were considered to be examples of successful workers and that their responses would be used to assist students in making career choices. Although there is no direct evidence of the success of these instructions in creating a non-threatening atmosphere, it is the subjective opinion of the investigators that this goal was accomplished in most cases.

Dependent Variables

Test Sample

The dependent variables for the test sample consisted of scores of incumbents in 44 occupations on the three previously described inventories (OVIS, MIQ, and MSQ).[5] Each of these inventories was scored on the following number of scales: MIQ, 20 scales; MSQ, 21 scales; OVIS, 24 scales. Thus, for each incumbent who completed all three inventories, there are 65 scores. The dependent variables for the test sample are depicted in Figure 8.

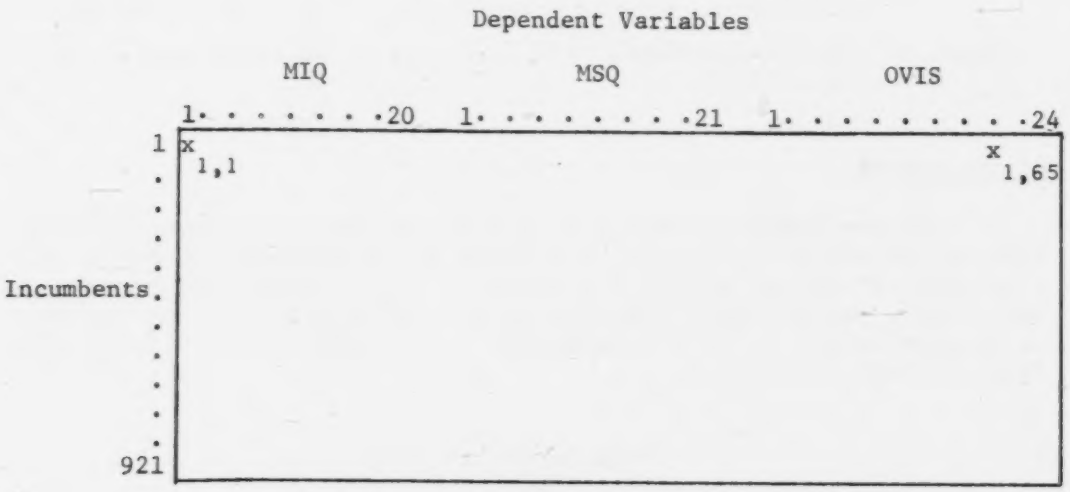

Figure 8. Matrix Containing Scores of 921 Job Incumbents on Three Self-Report Inventories

From the matrix in Figure 8, a second dependent variable matrix was derived by averaging scores for incumbents within occupations. This matrix is shown in Figure 9.

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[5]Three of the occupations in the original test sample were eliminated because an insufficient number of incumbents were obtained. These were: Assistant Branch Manager, Mason, and Welder.

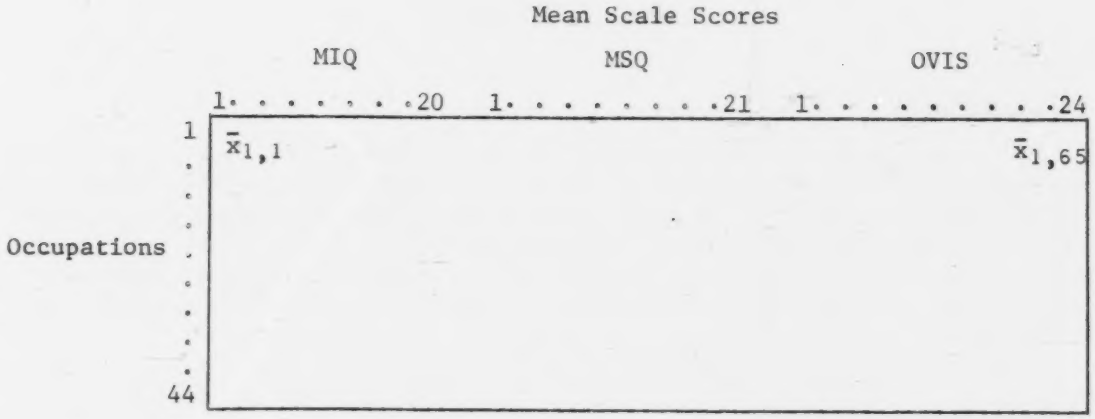

Figure 9. Matrix Containing Mean Scale Scores of Incumbents in 44 Occupations

Strong Sample

The dependent-variable data for the Strong sample were obtained from the existing literature. The first set of dependent-variable data consisted of average scores of incumbents in 49 occupations on each of the 22 SVIB Basic Scales (Campbell et al., 1968). Each score represented an average across 54 to 513 incumbents in a specified occupation. These data are depicted in Figure 10.

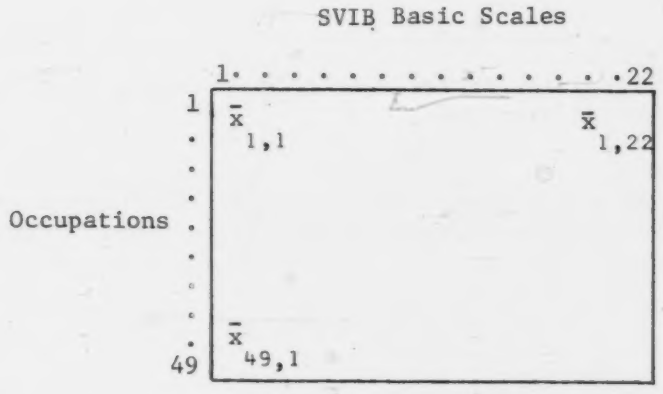

Figure 10. Matrix of Mean SVIB Scale Scores for 49 Occupations

The second set of dependent-variable data consisted of distance measures between paired occupations. These distance measures were computed from the published SVIB occupational item-key profiles, according to the formula:

$$D^2_{ab} = \Sigma (X_{aj} - X_{bj})^2$$

where X_{aj} and X_{bj} represent the item-key scores of occupations A and B, respectively, on Item J in the SVIB (Nunnally, 1967). Thus, the distance measure between two occupations consisted of the sum of the squared differences between their corresponding SVIB item-key scores. This procedure was used to compute a distance measure for all possible pairs of occupations in the Strong sample.

ORP Sample

The dependent variables for the ORP sample were also obtained from published data (Borgen et al., 1968). These data included the adjusted scale values on each reinforcer dimension in the Occupational Reinforcer Profile for each occupation in the sample. Although there are 20 reinforcer dimensions in the ORP, only 15 were included in the present study.[6] These 15 were dimensions which were considered to be meaningful across specific organizational situations and which had correspondents among the OAI need-requirement estimates. The data for the ORP sample are depicted in Figure 11.

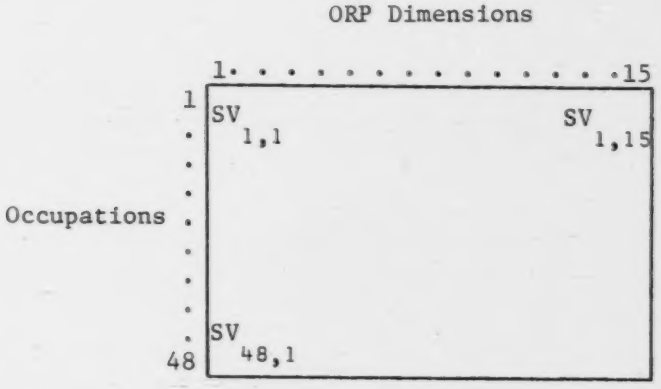

Figure 11. Matrix of ORP Scale Values for 48 Occupations

[6]Those scales not included were Company Policies and Practices, Co-Workers, Supervision--Technical, and Supervision--Human Relations. Moral Values was also eliminated because the ratings of OAI work elements on this need were unreliable, thus precluding the use of the OAI in obtaining reinforcer estimates for occupations on this need.

ANALYSES AND RESULTS

The analyses and results are presented under two major headings corresponding to the two purposes of this study. As noted, these purposes were: (1) to determine if OAI-derived occupational clusters were meaningful (i.e., discriminable) in terms of measured human interests and needs, and (2) to validate the OAI interest- and need-requirement estimates for occupations.

Discrimination Among Occupational Clusters

The first three hypotheses tested in this study pertain to the discriminability of OAI-derived occupational clusters in terms of the interest and need scores of job incumbents. The analyses and results are discussed separately for each of these hypotheses.

Hypothesis One

Hypothesis One stated that mean Ohio Vocational Interest Survey (OVIS) scores and Minnesota Importance Questionnaire (MIQ) need scores of job incumbents will differ significantly across OAI-derived occupational clusters.

The occupational clusters in this study were derived by a hierarchical clustering procedure developed by Ward (1963) and later modified by Veldman (1967). This procedure operates on a matrix of distance scores between the cases to be clustered. The distance score in this study was based upon the sum of the squared differences between corresponding elements in paired quantitative profiles. The clustering program begins by treating each of K individual cases as a group. The first stage of the procedure involves comparing each case with every other case and combining the two cases with the most similar profiles (i.e., with the smallest distance score). This reduces the number of groups to K -1. The next stage of clustering repeats this process and reduces the number of groups to K -2. This procedure is repeated through successive stages (K, K -1, K -2, . . . 1) until the number of groups is reduced to one containing all cases. At each stage or level of clustering, an error index is computed representing the profile variation within groups. The decision facing the user of this technique is one of choosing the level of grouping which is most appropriate, or "best," according to some criterion. One method for making this decision involves plotting the error index across the levels of clustering. The point just below the inflection in the error curve is taken as the optimum level of clustering, and the groups at this level are accepted as the "best" solution.

The hierarchical procedure just described was used in clustering the 47 occupations in the test sample. Three separate sets of profile data were used to compute distance scores among the 47 occupations. These included the job factor scores, attribute factor scores, and second-order factor scores described previously. The three resulting 47 x 47 distance matrices were subjected to separate cluster analyses which produced three sets of occupational clusters labeled: job clusters, attribute clusters, and second-order clusters.

Hypothesis One was tested by both multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA). Since the relevant question was whether or not the OAI-derived clusters were discriminable in terms of the OVIS and MIQ measures, the clusters were used as the categories of an independent (or classification) variable, and the OVIS and MIQ scores served as dependent variables. (See p. 41 for a description of the dependent variables.) The following one-way analyses of variance were performed separately across each of the three sets of occupational clusters: (1) one MANOVA including all OVIS scales, (2) one MANOVA including all MIQ scales, and (3) 44 individual ANOVA's treating each of the 24 OVIS scales and 20 MIQ scales separately as dependent variables. The computer program used for these analyses was a generalized least squares program for linear regression, multivariate and univariate analysis of variance, and analysis of covariance (Barr and Goodnight, 1971).

Tables 1 through 3 summarize the results of the multivariate analyses of variance. It can be seen that all the F-value approximations were significant at the .01 level. Three different test criteria were applied to the data: Hotelling-Lawley's Trace, Pillai's Trace, and Wilk's Lambda. According to Tatsuoka (1971), Wilk's Lambda and Hotelling's Trace were found in a Monte Carlo study to be about equally sensitive over a wide variety of population structures. In the present study, all three tests led to the same conclusion in every analysis.

As shown in Tables 1 and 2, the MANOVA's across job and attribute clusters were carried out on males and females combined and for each sex separately. The separate analyses by sex were required because of the possibility that the significant differences among clusters were a result of sex differences rather than intrinsic characteristics of the clusters themselves. This possibility was especially strong in the case of five OVIS scales which are scored differently for males and females. These differences might be expected to contribute to differences between clusters (and, therefore, spuriously inflate the F value) to the extent that males and females were disproportionately distributed among them.

In order to identify the particular interest and need dimensions which discriminate among clusters, it was also necessary to perform individual ANOVA's. Tables 4 and 5 summarize the results for the interest (OVIS) and need (MIQ) scales, respectively. An "X" in these tables indicates that the F value for the specified analysis exceeded the .01

Table 1. MANOVA's Across Job Clusters Using OVIS (Interest) and MIQ (Need) Scales as Dependent Variables

	Hotelling-Lawley's Trace		Pillai's Trace		Wilk's Lambda	
	F(app.)	df	F(app.)	df	F(app.)	df
			Interests			
Males and Females Combined[a]	4.1481*	200,7542	3.7149*	200,7650	3.8808*	200,6728
Males Only	3.4516*	144,2108	3.1821*	144,2148	3.2624*	144,2035
Females Only	4.0542*	120,1862	3.6100*	120,1890	3.7807*	120,1818
			Needs			
Males and Females Combined[a]	3.8878*	120,4550	3.6707*	120,4590	3.7512*	120,4635
Males Only	3.0112*	114,2138	2.8360*	114,2178	2.8774*	114,2033
Females Only	3.8113*	95,1887	3.5494*	95,1915	3.6351*	95,1824

*$p < .01$

[a]Analyses for males and females combined based only on the seven clusters with 60 or more scores per cluster.

Table 2. MANOVA's Across Attribute Clusters Using OVIS (Interest) and MIQ (Need) Scales as Dependent Variables

	Hotelling-Lawley's Trace		Pillai's Trace		Wilk's Lambda	
	F(app.)	df	F(app.)	df	F(app.)	df
			Interests			
Males and Females Combined	4.2190*	192,6018	3.9381*	192,6088	4.0399*	192,5699
Males Only	2.5477*	96,1414	2.4369*	96,1432	2.4657*	96,1392
Females Only	4.3823*	120,1862	3.9025*	120,1890	4.0877*	120,1818
			Needs			
Males and Females Combined	3.1308*	160,6050	2.9728*	160,6120	3.0235*	160,5615
Males Only	2.3333*	76,1434	2.2946*	76,1452	2.2891*	76,1404
Females Only	3.7480*	95,1887	3.5079*	95,1915	3.5840*	95,1824

*p < .01

Table 3. MANOVA for Second-Order Clusters[a]

	Hotelling-Lawley's Trace		Pillai's Trace		Wilk's Lambda	
	F(app.)	df	F(app.)	df	F(app.)	df
Interests	6.7239*	192,6986	5.9775*	192,7056	6.2978*	192,6621
Needs	3.9543*	160,6050	3.6303*	160,6120	3.7544*	160,5615

*p < .01

[a]Analyses run with males and females combined.

Table 4. Summary of Individual ANOVA's Across Clusters Using OVIS Scales as Dependent Variables

Scale	Job Clusters	Attribute Clusters	Higher-Order Clusters	Job Clusters Males	Job Clusters Females	Attribute Clusters Males	Attribute Clusters Females
Manual Work	X	X	X	X	X	X	X
Machine Work	X	X	X	X	X	X	X
Personal Service	X	X	X	X	X	X	X
Care of People or Animals	X	X	X	X	X	X	X
Clerical Work	X	X	X	X	X	X	X
Inspecting & Testing	X	X	X	X	X	X	X
Crafts	X	X	X	X	X	X	X
Customer Service	X	X	X	X	X	X	X
Nursing	X	X	X		X		X
Skilled Personal Serv.	X	X	X		X		X
Training							
Literary	X	X	X	X	X		X
Numerical	X	X	X		X		X
Appraisal	X	X	X	X			
Agriculture	X	X	X			X	
Applied Technology	X	X	X	X			
Promotion-Communication	X	X	X		X	X	
Management	X	X	X	X		X	
Artistic	X	X	X		X		
Sales Representative	X	X	X			X	
Music					X	X	
Entertainment	X	X	X				
Teach-Counsel-Soc. Work	X	X	X	X	X		
Medical	X	X	X		X		X

X indicates $p < .01$

Table 5. Summary of Individual ANOVA's Across Clusters Using MIQ Scales as Dependent Variables

Scale	Job Clusters	Attribute Clusters	Higher-Order Clusters	Job Clusters Males	Job Clusters Females	Attribute Clusters Males	Attribute Clusters Females
Ability Utilization					X	X	
Achievement	X	X	X				
Activity	X	X	X	X	X	X	X
Advancement	X	X	X		X	X	X
Authority	X	X	X	X		X	
Comp. Pol. & Practices	X				X	X	
Compensation	X		X	X		X	X
Co-Workers	X	X	X	X		X	
Creativity	X	X	X	X	X	X	X
Independence	X	X	X		X	X	X
Moral Values							
Recognition		X	X		X	X	X
Responsibility	X	X	X	X	X	X	X
Security	X	X	X	X	X	X	X
Social Service	X	X	X	X	X	X	X
Social Status	X			X		X	X
Supervision-Human Rel.						X	
Supervision-Technical	X	X	X	X		X	X
Variety							
Working Conditions	X	X	X	X		X	

X indicates $p < .01$

level of significance. More detailed results appear in Appendix G, where Tables 26 through 39 present the scale means and F values for the separate analyses, and Tables 40 through 49 present the standard deviations of the interest and need scores within the various clusters.

An inspection of the results presented in Table 4 shows that eight of the OVIS scales discriminated among the clusters in all seven analyses. These scales included: Manual Work, Machine Work, Personal Service, Care of People and Animals, Clerical Work, Inspecting and Testing, Crafts, and Customer Service. Eight additional scales were significant in at least five of the seven analyses. These were Nursing, Skilled Personal Service, Literary, Numerical, Promotion-Communication, Management, Teaching-Counseling-Social Work, and Medical. Only one interest scale, Training, consistently failed to discriminate among the clusters. In the analyses by sex, one of the scales (Management) that consistently discriminated among clusters in the male sample did not discriminate in the female sample, while five scales that consistently discriminated among clusters in the female sample failed to discriminate in the male sample. These latter scales included: Nursing, Skilled Personal Service, Literary, Numerical, and Medical. Caution should be exercised, however, in generalizing beyond the present data in regard to sex differences in scale discrimination. These findings are very likely related to the sample of occupations and incumbents included in the present study. For example, the finding that the Nursing scale discriminated only in the female sample might be due to the fact that, in the present study, all incumbents in nursing-related occupations (i.e., nurse, nurse aide, and licensed practical nurse) were females. If male nurses or aides had been included, the results might have been quite different for that scale. A scale can only discriminate to the extent to which there is variation along the scale.

From the results summarized in Table 5, it can be seen that 13 of the 20 MIQ (need) scales discriminated among clusters in at least five of the seven analyses. These were: Activity, Creativity, Responsibility, Security, Social Service, Advancement, Authority, Compensation, Co-Workers, Independence, Recognition, Supervision--Technical, and Working Conditions. The first five of these scales were significant in all seven analyses. Only two scales, Moral Values and Supervision--Human Relations, failed to show significance in any analysis. In the analyses by sex, three scales that consistently discriminated among clusters in the male sample did not discriminate in the female sample. These three scales were: Authority, Co-Workers, and Working Conditions. On the other hand, no scale that consistently discriminated among clusters in the female sample failed to discriminate in at least one analysis in the male sample.

A word of caution is in order concerning both the MANOVA and ANOVA results. One of the basic assumptions underlying the analysis of variance model is homogeneity of within-group variances. It is clear, however, from an examination of Tables 40-49 in Appendix G, that this assumption was violated in at least some of the analyses. Moreover, the

problem of heterogeneity of variance is compounded by unequal sample sizes among the occupational clusters. The approach taken in dealing with this problem was to select the relatively conservative alpha level of .01, rather than the level of .05, which would have been used had the variance assumption been met. The alpha level .01 was also used in the previously described multivariate analyses of variance.

Hypothesis Two

The second hypothesis was stated as follows: Mean SVIB basic scale scores of job incumbents will differ significantly across OAI-derived occupational clusters.

The first step in testing Hypothesis Two involved clustering the occupations in the Strong sample. The clustering procedure was the same as that described previously, with the level of clustering determined in the same manner. Two cluster analyses were performend, one using profiles based on OAI job factors and the other using profiles based on OAI attribute factors. (These factors are described on pp. 33 - 34.) The results of these cluster analyses are presented in Appendix H. The discriminability of the clusters was tested by one-way analyses of variance, treating the two sets of clusters as classification variables and the mean SVIB basic scale scores of incumbents in occupations as dependent variables. (The dependent variables are described on pp. 41 - 43.) Separate univariate ANOVA's were carried out for each SVIB scale across each of the two sets of clusters. Multivariate analysis of variance was not used in testing Hypothesis Two because of the small within-cluster sample sizes in relation to the number of dependent variables. Analyses were conducted only on those clusters containing four or more occupations (i.e., groups with n's of four or more). As in the analyses associated with Hypothesis One, a relatively conservative alpha level of .01 was applied.

Tables 6 through 9 present the results of these analyses. Four of the SVIB scales were significant ($p < .01$) in the analyses for both sets of clusters. These scales were: Merchandising, Adventure, Religious Activities, and Teaching. Eight additional scales were significant for one set of clusters, and ten scales failed to reach significance in either analysis. A comparison of Tables 6 and 8 shows that the job clusters were more frequently discriminable than the attribute clusters. Ten of the F values for the job clusters were significant, while only six F values were significant for the attribute clusters.

Hypothesis Three

Hypothesis Three was stated as follows: Mean distance scores for pairs of occupations, based on SVIB occupational item-key profiles, will be significantly smaller when computed among occupations within OAI-derived clusters than when computed among occupations from different OAI clusters.

Table 6. Mean SVIB Basic Scale Scores and F Values for the Job Clusters

Scale	1 N=5	2 N=10	3 N=6	4 N=5	5 N=4	ANOVA for Means $F_{(4,25)}$
Public Speaking	47.20	47.20	47.00	48.00	50.75	1.24
Law/Politics	46.00	44.20	50.00	44.80	47.75	3.39*
Business Management	51.20	52.50	48.16	54.00	51.75	4.88**
Sales	45.40	50.20	53.16	52.20	59.50	4.15*
Merchandising	47.80	50.80	51.33	54.20	57.00	6.46**
Office Practices	55.20	50.20	49.83	48.80	48.50	1.83
Military Activities	49.80	46.50	46.16	47.00	46.25	0.77
Tech. Responsibility	54.00	48.90	48.16	52.40	53.00	3.76*
Mathematics	45.60	49.10	51.16	51.40	57.25	3.11*
Science	49.60	49.80	51.66	49.00	53.00	2.55
Mechanical	51.40	53.00	48.50	57.60	52.50	4.15**
Nature	50.00	47.60	48.00	48.60	49.25	1.14
Agriculture	45.40	50.20	51.33	52.20	54.50	1.85
Adventure	49.40	51.30	54.00	58.40	60.25	6.37**
Recreational Ldshp.	44.60	46.50	49.00	48.20	53.00	4.07*
Medical Service	47.60	49.90	53.16	58.40	62.25	9.31**
Social Service	45.80	47.60	55.50	50.80	54.75	5.35**
Religious Activities	58.40	50.60	45.50	50.40	48.00	8.59**
Teaching	48.80	51.30	52.00	62.40	60.50	14.05**
Music	51.60	51.60	48.50	61.20	55.75	5.52**
Art	49.60	47.20	46.66	45.40	48.25	0.63
Writing	50.60	54.70	48.83	58.20	56.00	5.51**

**$p < .01$
*$p < .05$

Table 7. Standard Deviations of SVIB Basic Scale Scores Within Job Clusters

Scale	1 N=5	2 N=10	3 N=6	4 N=5	5 N=4
Public Speaking	1.09	3.73	1.26	2.54	4.34
Law/Politics	2.44	1.31	6.44	0.83	2.50
Business Management	2.38	2.99	1.83	2.00	0.95
Sales	4.44	7.34	3.76	4.43	1.29
Merchandising	1.30	3.01	3.66	3.11	2.94
Office Practices	3.83	5.92	2.78	3.96	2.38
Military Activities	3.03	3.92	5.77	3.08	1.70
Tech. Responsibility	6.20	2.07	2.31	2.88	2.16
Mathematics	6.10	5.97	2.63	5.94	2.06
Science	2.40	2.82	0.81	2.12	2.16
Mechanical	2.07	4.64	1.37	5.68	1.00
Nature	3.46	1.17	2.68	0.54	3.09
Agriculture	3.78	5.75	4.96	7.36	2.88
Adventure	2.50	2.26	7.09	4.50	2.50
Recreational Ldshp.	2.70	3.80	2.00	3.70	4.08
Medical Service	2.30	2.60	3.76	7.56	5.96
Social Service	5.40	4.14	4.67	4.86	1.89
Religious Activities	4.03	3.53	3.27	5.41	1.41
Teaching	3.03	2.98	2.44	4.33	6.13
Music	5.31	5.87	4.50	3.27	2.36
Art	4.61	4.91	5.71	2.60	0.95
Writing	2.60	5.25	3.18	2.68	1.82

Table 8. Mean SVIB Basic Scale Scores and F Values for the Attribute Clusters

Scale	1 N=4	2 N=4	3 N=5	4 N=4	5 N=5	6 N=4	7 N=4	$F_{(6,23)}$
Public Speaking	46.50	48.75	47.80	47.75	46.40	49.75	49.00	0.40
Law/Politics	45.25	47.75	45.00	45.25	45.60	47.00	47.50	0.90
Business Management	52.75	52.25	51.60	52.50	51.00	56.50	50.75	0.97
Sales	48.75	49.50	53.40	42.75	53.80	45.50	57.50	4.75**
Merchandising	47.50	53.00	56.60	49.25	52.60	48.25	56.00	5.50**
Office Practices	52.75	49.75	50.80	57.75	48.00	45.50	49.50	6.56**
Military Activities	48.75	48.75	45.80	49.75	43.40	46.25	46.00	2.30
Tech. Responsibilities	52.75	61.00	52.20	51.25	49.20	50.50	51.75	3.32*
Mathematics	48.25	48.75	51.20	43.25	53.40	45.25	54.50	3.15*
Science	50.50	52.50	50.40	47.50	51.00	51.00	51.75	0.95
Mechanical	50.50	52.25	52.60	53.00	51.00	58.50	52.00	1.84
Nature	48.75	52.00	48.80	49.75	46.80	49.50	49.00	2.09
Agriculture	46.50	49.00	52.80	45.50	52.20	46.25	52.00	1.61
Adventure	48.00	53.75	58.40	51.50	56.00	50.25	60.00	5.31**
Recreational Ldshp.	46.25	48.75	49.00	43.25	48.00	47.50	51.75	1.73
Medical Service	47.25	54.25	55.20	49.25	52.60	50.75	60.25	2.65*
Social Service	48.25	48.75	51.20	43.25	54.20	46.75	53.75	3.36*
Religious Activities	54.00	54.00	51.60	58.75	46.80	49.50	48.25	6.20**
Teaching	49.50	57.75	59.80	48.50	52.60	53.50	59.25	4.07**
Music	48.25	55.50	58.80	56.50	49.60	54.00	55.75	2.28
Art	50.50	48.25	45.60	47.00	45.00	43.75	48.75	1.73
Writing	50.25	54.25	57.00	52.25	52.80	54.75	55.25	1.60

**$p < .01$
*$p < .05$

Table 9. Standard Deviations of SVIB Basic Scale Scores Within Attribute Clusters

Scale	1 N=4	2 N=4	3 N=5	4 N=4	5 N=5	6 N=4	7 N=4
Public Speaking	1.29	3.30	1.48	6.13	1.14	6.29	5.88
Law/Politics	0.95	3.20	0.70	3.40	2.88	2.82	2.64
Business Management	7.54	1.50	2.40	1.29	3.53	5.32	2.62
Sales	5.31	5.19	4.82	4.27	3.11	6.85	3.10
Merchandising	2.38	3.26	1.81	3.40	3.13	4.92	3.16
Office Practices	2.50	1.70	3.76	3.30	2.34	2.51	4.35
Military Activities	2.87	2.87	4.08	2.21	3.50	3.30	1.41
Tech. Responsibility	6.99	4.69	3.42	5.12	2.16	2.88	3.77
Mathematics	5.73	3.86	6.05	4.03	3.20	4.99	4.65
Science	1.29	2.38	2.30	1.29	2.54	6.87	2.75
Mechanical	1.29	2.21	3.13	0.81	4.30	8.42	1.63
Nature	1.50	1.41	0.83	4.19	1.48	1.73	3.16
Agriculture	4.65	4.54	7.39	2.64	4.20	6.99	3.16
Adventure	1.82	2.50	3.36	2.51	6.28	4.92	2.94
Recreational Ldshp.	2.36	1.70	3.53	4.78	3.93	5.25	5.12
Medical Service	2.62	6.75	4.26	2.98	3.71	6.18	8.61
Social Service	5.37	0.95	5.35	2.62	6.30	4.03	2.06
Religious Activities	4.69	2.58	4.92	2.98	3.27	1.00	1.70
Teaching	3.31	4.57	4.76	1.91	3.28	5.44	7.67
Music	1.89	4.65	3.27	1.91	8.04	9.09	2.36
Art	5.80	1.25	2.88	3.16	4.00	4.64	1.70
Writing	1.50	3.40	2.23	2.50	6.41	3.40	3.09

The procedure for testing Hypothesis Three involved the use of OAI-derived occupational clusters as a classification variable and the distance score between occupations as a dependent variable. In preparation for the statistical analyses, the occupations in the Strong sample were clustered (by the previously described procedure) based on their OAI job factor profiles, and distance scores were computed for all pairs of occupations based on their SVIB occupational item-key profiles. Five occupational clusters containing 6 to 46 occupations each were selected for subsequent analyses.

Hypothesis Three was tested by comparing the mean of the distance scores between occupations within a specified cluster with the mean of the distance scores between each of those same occupations and all of the occupations outside that cluster. This comparison was made separately for each of the five occupational clusters. The statistical procedure was a one-way analysis of variance with a two-category independent variable: occupations within a cluster and occupations outside that cluster.

The results of these analyses are shown in Table 10. Four of the five analyses showed significant differences in the expected direction. An alpha level of .01 was applied in these tests for the reasons explained earlier in connection with Hypothesis One and Two--i.e., because of heterogeneity of variance and unequal n's.

Validation of OAI Interest- and Need-Requirement Estimates

The final four hypotheses pertain to the second purpose of the study: to test the validity of the OAI interest- and need-requirement estimates for occupations. The analyses and results associated with these hypotheses are described in the sections which follow.

Procedure for Deriving Attribute-Requirement Estimates

As indicated previously, three different methods were used to derive attribute-requirement estimates for occupations. These three methods involved the use of the OAI job factor scores, the OAI attribute factor scores, and the OAI item ratings. Since it was infeasible to use all three sets of interest- and need-requirement estimates in the analyses performed in this study, only one of the three sets was selected. It was decided to intercorrelate all three sets of estimates on the basis of the previously described sample of 822 occupations and to select the set correlating highest with the other two. The resulting correlations are shown in Appendix I, Tables 52 and 53. Although most of these correlations are high, there is a slight trend in favor of the estimates based on item ratings. Accordingly, the interest- and need-requirement estimates based on OAI item ratings were used in testing Hypotheses Four through Seven.

Table 10. Means, Standard Deviations, and F Values for Comparisons of Distance Scores Within and Outside OAI-Derived Occupational Clusters

Cluster	N Within	Mean Within	Std. Dev. Within	N Outside	Mean Outside	Std. Dev. Outside	df	F
1	10	263.20	88.97	210	345.87	95.11	1,218	7.24*
2	46	299.43	92.22	360	320.40	90.77	1,404	2.16
3	15	227.00	55.19	246	314.50	81.16	1,259	16.92*
4	10	265.60	45.95	210	334.16	83.46	1,218	6.63*
5	6	243.16	47.93	174	383.34	109.99	1,180	9.64*

*$p < .01$

Note: Distance scores between occupations were based on SVIB occupational item-key profiles.

In addition to the OAI procedure for deriving attribute-requirement estimates for occupations, it was decided to explore a more direct procedure. This method involved rating occupations directly on the attribute definitions contained in the Attribute Requirement Inventory (ARI) (Neeb et al., 1971), rather than rating occupations on the OAI items which, in turn, were weighted on the ARI attributes. The direct-rating procedure was included for two purposes. First, it served as a procedural check on the rather involved "synthetic" procedure based on the OAI; and, secondly, it provided an opportunity to compare the direct-rating and synthetic approaches to estimating the attribute requirements of jobs and occupations. (See Neeb et al., 1971, for a discussion of synthetic validity.)

Data for the comparison between the two sets of estimates were obtained for a sample of 79 occupations. Each occupation was rated by three judges on both the ARI attribute definitions and the OAI items. The judges who rated occupations directly on attributes had master's degrees in psychology; the OAI raters had either master's degrees in psychology or training in job analysis. Attribute-requirement estimates based on direct ratings were obtained by taking the mean rating for each occupation on each of the defined interests and needs. The derivation of the OAI-based attribute-requirement estimates involved the following two steps: (1) an average rating was computed for each occupation on each of the OAI items, and (2) the average OAI item profile for each occupation was used in deriving an attribute-requirement profile for the occupation through the previously described procedure (i.e., the procedure based on OAI item ratings).

A correlation was then computed between the two sets of estimates for each of 40 interests and needs. The results are presented in Appendix J, Table 54. All 40 correlations are statistically significant, and 29 of these (approximately 70 percent) are above .60. These correlations were somewhat attenuated by unreliability in the direct estimates; the median reliability for average direct estimates based on three judges was only .74, while that for the snythetic estimates was .88 (see Tables 55 and 56, Appendix J). (Additional reliability data for the synthetic and direct attribute-requirement estimates are shown in Tables 57-60 of Appendix J.) It must be concluded, however, that although the two sets of estimates are significantly related, they are not interchangeable. The attribute-requirement estimates based on direct (ARI) ratings were excluded from all subsequent analyses.

Hypothesis Four

The fourth hypothesis in this study stated that OAI-derived estimates of the interest- and need-requirements of occupations will correlate significantly with the corresponding average OVIS interest scores and MIQ need scores on incumbents in these occupations. This hypothesis was tested with 43 occupations in the case of interests and 41 occupations for needs. The average number of incumbents contributing data for

each occupation was 21 for the OVIS and 19 for the MIQ, with the numbers ranging from 6 to 49 for the OVIS and from 5 to 45 for the MIQ. A list of the occupations, with the number of incumbents sampled in each, appears in Appendix K, Tables 61 and 62.

Table 11 presents the results for interests. Of the 24 correlations computed, 16 were statistically significant, and 13 exceeded a value of .40. The interests with significant correlations were: Manual Work, Machine Work, Crafts, Nursing, Skilled Personal Service, Training, Literary, Numerical, Appraisal, Agriculture, Applied Technology, Promotion-Communication, Management, Sales Representative, Teaching-Counseling-Social Work, and Medical. However, one of these, Skilled Personal Service, had a significant negative correlation, which is contrary to the rationale underlying Hypothesis Four.

Only 15 of the 20 MIQ scales were used in the needs analysis. The five scales omitted were: Company Policies and Practices, Co-Workers, Moral Values, Supervision--Human Relations, and Supervision--Technical. The Moral Values scale was eliminated because the OAI-derived estimate for this need was unreliable. The other four scales were omitted because they pertain to situational factors which are not necessarily constant across specific work situations within the same occupation. The results for the remaining 15 scales are shown in Table 12. Of the 15 correlations, nine are statistically significant. Three of the needs had significant positive correlations. These were Creativity, Responsibility, and Social Service. Another six needs had significant negative correlations, which are contrary to the rationale behind Hypothesis Four. These six needs were: Activity, Compensation, Independence, Security, Social Status, and Working Conditions.

Hypothesis Five

The fifth hypothesis was stated as follows: There will be a significant relationship between the OAI need-requirement (reinforcer) estimates for occupations and the MSQ satisfaction scores of incumbents in these occupations, and this relationship will be moderated by the incumbents' MIQ need scores. Hypothesis Five was broken down into three specific predictions: (a) there will be a significant OAI need-reinforcer (requirement) main effect; (b) there will be a significant interaction between the MIQ need and OAI need-reinforcer factors; and (c) the high-need, high-reinforcer group will have significantly higher satisfaction scores than the high-need, low-reinforcer group.

This hypothesis was tested in a two-by-two factorial design, with OAI need-requirement scores for occupations serving as one independent variable, MIQ need scores of job incumbents as the second independent variable, and MSQ (satisfaction) scores of incumbents as the dependent variable. Under the design, a separate analysis of variance was performed for each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ satisfaction scale. In each case, incumbents

Table 11. Correlations Between OAI Interest-Requirement Estimates and Mean OVIS Interest Scores of Incumbents in 43 Occupations

Scale	N = 43
Manual Work	.54*
Machine Work	.59*
Personal Service	-.29
Care of People or Animals	.18
Clerical Work	-.05
Inspecting and Testing	.00
Crafts	.56*
Customer Service	-.16
Nursing	.32*
Skilled Personal Service	-.41*
Training	.30*
Literary	.43*
Numerical	.42*
Appraisal	.59*
Agriculture	.52*
Applied Technology	.68*
Promotion and Communication	.62*
Management	.55*
Artistic	-.12
Sales Representative	.36*
Music	.15
Entertainment	-.06
Teaching, Counseling, and Social Work	.50*
Medical	.53*

*$p < .05$

Table 12. Correlations Between OAI Need-Requirement Estimates and Average MIQ Need Scores of Incumbents in 41 Occupations

Scale	N = 41
Ability Utilization	.10
Achievement	.13
Activity	-.39*
Advancement	-.20
Authority	.14
Compensation	-.48*
Creativity	.64*
Independence	-.60*
Recognition	-.29
Responsibility	.49*
Security	-.30*
Social Service	.44*
Social Status	-.30*
Variety	-.22
Working Conditions	-.43*

*p < .05

were divided into high- and low-scoring groups on a specified MIQ need, occupations were divided into high and low groups on the corresponding OAI need-requirement estimate, and scores of incumbents on the appropriate MSQ scale were entered in the cells of the two-by-two ANOVA table. In the case of both independent variables, the high category contained the upper third of the scores on that variable, and the low category contained the lower third. The middle third of the scores on each independent variable was excluded from the analysis.

Tables 13 through 16 present the results of these analyses. The results pertaining to Hypothesis 5a are shown in Table 13, where it can be seen that nine of the 15 F values for reinforcer main effects are significant ($p < .05$). However, one of these main effects (Working Conditions) was not in the predicted direction. The eight significant main effects that were in the predicted direction include: Advancement, Authority, Compensation, Creativity, Responsibility, Social Service, Social Status, and Variety.

As shown in Table 14, only three of the F values for the need-by-reinforcer interaction (Hypothesis 5b) were significant ($p < .05$), although four additional F values were beyond the .20 level. The seven scales with need-by-reinforcer F values beyond the .20 level were retained for testing Hypothesis 5c. For this purpose, the simple main effect between the high-need, high-reinforcer group and the high-need, low-reinforcer group was tested with the Student's *t* statistic. (For the remaining eight scales, the test for Hypothesis 5a also served as a test for Hypothesis 5c, since the need-by-reinforcer interactions for these scales did not approach significance.) The results, which appear in Table 16, were all in support of Hypothesis 5c, since all seven scales discriminated between the two groups. These scales were: Ability Utilization, Activity, Advancement, Authority, Responsibility, Social Service, and Social Status. In addition, three scales whose need-by-reinforcer interactions did not approach significance had significant reinforcer main effects which, in this case, supported Hypothesis 5c as well as 5a. These scales were Compensation, Creativity, and Variety. Thus, the results for 10 out of the 15 scales supported Hypothesis 5c. Although no prediction was made concerning the reinforcer simple main effect under the low-need condition, Table 16 shows the results of the tests for this effect. It can be seen that three of the seven *t* values for this effect are significant.

Hypothesis Six

Hypothesis Six stated that general satisfaction, as measured by the MSQ, will be positively related to the degree of congruence between the worker's MIQ need profile and the OAI need-reinforcer profile of his occupation.

The measure of congruence between the worker and his occupation consisted of the sum of a set of *a priori* weights associated with the

Table 13. Mean Satisfaction Scores and ANOVA Results for the OAI Reinforcer Main Effect

Scale	N	Hi-Reinf.	N	Lo-Reinf.	df	F
Ability Utilization	162	16.49	185	16.07	1,343	.80
Achievement	169	17.08	209	16.79	1,374	.50
Activity	166	17.66	235	17.01	1,397	2.41
Advancement	187	14.47	222	12.41	1,405	19.72*
Authority	155	16.09	199	14.76	1,350	13.13*
Compensation	171	13.94	214	12.50	1,381	11.10*
Creativity	156	16.80	227	14.58	1,379	23.78*
Independence	173	16.75	187	16.78	1,356	.00
Recognition	177	14.74	228	14.35	1,401	.73
Responsibility	155	17.03	228	15.43	1,379	17.80*
Security	170	16.77	162	16.87	1,328	.05
Social Service	174	18.86	224	15.67	1,394	60.38*
Social Status	243	15.91	302	15.00	1,541	9.05*
Variety	201	16.70	182	15.85	1,379	3.09*
Working Conditions	177	14.49	160	15.49	1,333	3.98*

*$p < .05$

Table 14. ANOVA Results for Need x Reinforcer Interaction

Scale	df	F
Ability Utilization	1,343	2.65*
Achievement	1,374	0.00
Activity	1,397	1.91*
Advancement	1,405	5.79**
Authority	1,350	4.06**
Compensation	1,381	0.00
Creativity	1,379	0.73
Independence	1,356	0.04
Recognition	1,401	0.41
Responsibility	1,379	2.50*
Security	1,328	0.52
Social Service	1,394	3.37*
Social Status	1,541	9.02**
Variety	1,379	0.17
Working Conditions	1,333	0.00

**$p < .05$
*$p < .20$

Table 15. Standard Deviations for Need-Reinforcer Combinations (Cells)

Scale	N	Hi Need-Hi-Reinf.	N	Hi Need-Lo-Reinf.	N	Lo Need-Hi-Reinf.	N	Lo Need-Lo-Reinf.
Ability Utilization	76	4.56	71	5.13	86	3.82	114	4.18
Achievement	87	4.00	95	3.65	82	3.63	114	4.32
Activity	61	4.51	145	4.20	105	4.11	90	3.76
Advancement	88	5.10	103	4.67	99	4.06	119	4.78
Authority	67	4.15	78	3.86	88	2.77	121	3.06
Compensation	57	4.69	101	4.09	114	3.87	113	4.36
Creativity	97	4.72	66	4.44	59	4.98	161	3.86
Independence	63	4.25	120	3.74	110	3.56	67	3.53
Recognition	70	4.50	98	5.05	107	4.16	130	4.65
Responsibility	89	4.13	72	3.53	66	3.45	156	3.45
Security	67	4.02	79	3.94	103	3.81	83	4.52
Social Service	103	3.83	90	4.29	71	4.03	134	4.07
Social Status	94	3.71	168	4.10	149	2.75	134	3.34
Variety	90	4.64	88	4.91	111	4.21	94	5.16
Working Conditions	79	4.39	73	4.46	98	5.23	87	4.12

Table 16. Results of the Tests for Reinforcer Simple Main Effects

Scale	Low Need				High Need			
	Lo-R	Hi-R	df	t	Lo-R	Hi-R	df	t
Ability Utilization	16.45	16.23	198	- .12	15.45	16.78	155	1.73*
Activity	16.77	17.08	193	.54	17.16	18.67	204	2.32*
Advancement	13.34	14.36	216	1.59	11.34	14.60	189	5.17*
Authority	14.70	15.37	143	1.65*	14.87	17.04	207	1.81*
Responsibility	15.35	16.18	220	1.66*	15.59	17.66	159	3.38*
Social Service	15.31	17.42	203	3.58*	16.21	19.85	191	6.19*
Social Status	15.10	15.26	281	.44	14.91	16.93	260	4.03*

*p < .05

distances (and their directions) between the worker and his occupation on selected need dimensions. These "match" weights, shown in Table 17, were based on the investigators' judgments of the implications that different combinations of MIQ need scores and OAI occupational reinforcer estimates for a particular need dimension had in terms of worker satisfaction relative to that dimension. As shown in Table 17, the match weights were established separately for "extrinsic" and "intrinsic" needs, whose assignments to these two categories were also based on the investigators' judgments (see Footnotes b and c of Table 17).

Preparatory to establishing the match weights, the need scores of workers and the reinforcer estimates of occupations were transformed into one of three values: +1, if a need score or reinforcer estimate fell above +.94 standard deviations from the mean (for all workers or occupations in the study); -1, if the value in question fell below -.94 standard deviations from the mean; and 0, if the value fell within .94 standard deviations of the mean. Thus, for each MIQ dimension there were nine possible combinations of need scores and occupational reinforcer estimates and, therefore, nine possible match weights which a worker might receive on a given dimension.

After separate match weights were determined between every worker and his occupation on all of the selected MIQ dimensions, extrinsic, intrinsic, and overall worker-occupation congruence scores were derived by summing the appropriate match weights. (As mentioned earlier, the extrinsic and intrinsic congruence scores were summed to obtain the overall congruence score.) All workers in the study were then ranked on each of the three congruence measures, and upper and lower quartiles were established for each set of measures.

Hypothesis Six was tested by statistically comparing the mean satisfaction scores between the two groups formed by workers among the lowest and highest 25 percent on need-reinforcer congruence. Two such groups were formed from each of the three sets of congruence scores (i.e., one pair of groups for each set of scores), and each pair of groups was compared on an appropriate dependent variable: extrinsic, intrinsic, or overall satisfaction scores, depending upon the nature of the congruence measure from which the groups were formed. A worker's extrinsic and intrinsic satisfaction scores were obtained by summing the MSQ scale scores corresponding to the MIQ dimensions used to compute the extrinsic and intrinsic congruence scores (see Footnotes b and c, Table 17); his MSQ general score was used as an index of "overall" satisfaction.

Table 18 presents the mean satisfaction scores for the three pairs of groups and the F values for comparisons between groups. As shown, the mean for the high-congruence group exceeds that for the low-congruence group in all three cases ($p < .01$).

Table 17. Worker-Occupation Match Weights for Nine Possible Combinations of Scale Scores Under Extrinsic and Intrinsic Needs

Scale Scores for Worker	Scale Scores for Occupation	Worker-Occupation[a] Match Weight
	Extrinsic Needs[b]	
+1	+1	+2
+1	0	-1
+1	-1	-2
0	+1	+1
0	0	0
0	-1	-1
-1	+1	0
-1	0	0
-1	-1	0
	Intrinsic Needs[c]	
+1	+1	+2
+1	0	-1
+1	-1	-2
0	+1	0
0	0	0
0	-1	-1
-1	+1	-1
-1	0	0
-1	-1	0

[a]A match weight could have one of nine possible values.

[b]A worker-occupation match weight was determined for each of the following extrinsic needs: Activity, Advancement, Authority, Compensation, Independence, Recognition, Security, Social Status, Variety, and Working Conditions.

[c]A worker-occupation match weight was determined for each of the following intrinsic needs: Ability Utilization, Achievement, Creativity, Responsibility, and Social Services.

Table 18 Mean Satisfaction Scores of Job Incumbents with Low and High Need-Reinforcer Congruence Scores, and F Values for Comparisons Between the Low- and High-Congruence Groups

	Low-Congruence Group (N=187)	High-Congruence Group (N=187)	F Value$_{(1,372)}$
Extrinsic	146.62	160.06	19.46*
Intrinsic	77.49	83.94	12.04*
Overall	61.60	65.73	9.96*

*$p < .01$

Note--The Low-Congruence Group contained the job incumbents whose congruence scores fell below the lowest quartile (among the job incumbents in the study); the High-Congruence Group contained incumbents whose congruence scores fell above the highest quartile.

Hypothesis Seven

The final hypothesis in this study stated that the OAI need-requirement estimates for a sample of occupations would correlate significantly with the corresponding ORP estimates from the Minnesota Work Adjustment Project. The data used in testing this hypothesis consisted of 15 OAI need-requirement (reinforcer) estimates and the corresponding ORP estimates for 48 occupations. The occupations included in the sample are listed in Appendix A.

In the analysis for Hypothesis Seven, a correlation was computed between the two sets of variables for each of 15 defined human needs. As shown in Table 19, 9 of the 15 needs had significant correlations, namely: Ability Utilization, Achievement, Authority, Creativity, Responsibility, Social Service, Social Status, and Variety.

Table 19. Correlations Between OAI Need-Requirement (Reinforcer) Estimates and Corresponding ORP Estimates for 48 Occupations

Scale	R
Ability Utilization	.334*
Achievement	.439*
Activity	.125
Advancement	.072
Authority	.268*
Compensation	-.154
Creativity	.541*
Independence	.000
Recognition	-.053
Responsibility	.530*
Security	.322*
Social Service	.727*
Social Status	.369*
Variety	.334*
Working Conditions	.196

*$p < .05$

DISCUSSION AND CONCLUSIONS

The present study was carried out as part of a continuing research and development program in the area of ergometrics (Cunningham, 1971; Cunningham, Tuttle, Floyd, and Bates, 1971). Preceding reports in the Ergometric Research and Development Series have described the development of the Occupation Analysis Inventory (Cunningham et al., 1971), the derivation of attribute-requirement profiles for the OAI work elements (Neeb, Cunningham, and Pass, 1971), and the derivation of work dimensions based on the OAI elements (Riccobono and Cunningham, 1971a, 1971b). As a result of the work contained in these reports, it is possible to describe any job or occupation rated on the OAI in terms of (a) a profile of scores on work dimensions representing observable activities and conditions and (b) a profile of scores representing the job's requirements for 103 human attributes for which there are tests. In addition to describing individual jobs and occupations rated on the OAI, the work-dimension profiles provide a quantitative basis for comparing and clustering occupations. The resulting clusters can, in turn, be described by the average work-dimension and attribute-requirement profiles of their constituent occupations. Potential applications of the OAI framework and procedures have been discussed elsewhere (pp. 4-5 of the present paper; Cunningham et al., 1971).

Before the OAI system is applied, however, evidence should be presented supporting its validity. Since the OAI was designed to describe jobs and occupations in terms relevant to human behavior, it was decided to validate the OAI work descriptors against existing measures of behavioral potential. Accordingly, the present study was designed as an attempt to demonstrate significant relationships between the OAI work variables (i.e., the OAI work-dimension scores and attribute-requirement estimates) and selected measures in the affective domain.

The two main purposes of this study were:

(1) To determine if clusters formed by occupations with similar OAI work-dimension profiles would be meaningful (i.e., discriminable) in terms of the interest and need questionnaire responses of persons employed in occupations comprising the clusters.

(2) To determine if there would be significant relationships between the OAI interest- and need-requirement (reinforcer) estimates for samples of occupations and three sets of criterion variables: (a) the scores of job incumbents on corresponding interest and need scales; (b) satisfaction scores of job incumbents; and (c) Occupational Reinforcer Patterns from the Minnesota Work Adjustment Project (Borgen et al., 1968). (The last two sets of variables were used as criteria only for the OAI need-requirement estimates.)

The results of the study are discussed below in relation to its two main purposes.

Discrimination Among Occupational Clusters

The first three hypotheses tested in this study pertained to the discriminability of OAI-derived occupational clusters in terms of the interest and need questionnaire responses of persons employed in occupations comprising the clusters.

Hypothesis One

The first hypothesis dealt with the question of discriminability among OAI-derived occupational clusters in terms of the OVIS and MIQ scores of job incumbents. The tests for this hypothesis consisted of the following one-way analyses of variance, performed separately across each of three different sets of occupational clusters: (1) one MANOVA including all OVIS scales, (2) one MANOVA including all MIQ scales, and (3) 44 individual ANOVA's treating each of the 24 OVIS scales and 20 MIQ scales separately as dependent variables. Each of the 44 individual ANOVA's was performed separately with three different samples: (1) a total sample consisting of both males and females, (2) a subsample containing males only, and (3) a subsample containing females only.

The results support Hypothesis One. In the case of both the OVIS and MIQ scores, all of the multivariate analyses of variance (MANOVA's) were significant. In addition, 16 of the OVIS scales and 13 of the MIQ scales showed significant differences between clusters in at least 5 out of the 7 individual ANOVA's performed for each scale, and only 4 of the 44 scales failed to discriminate among clusters in less than two analyses.

As indicated previously, there were unequal variances and n's among the occupational clusters. This violation of the analysis-of-variance model can affect the sampling distribution of the F statistic in a way that can cause either negative or positive bias in relation to the F table (Winer, 1971). Moreover, this effect can be expected to be greater for the multivariate analyses of variance than for the univariate analyses of variance. The approach taken in dealing with this problem was to select the relatively conservative alpha level of .01, rather than the alpha level of .05, which would have been used had the variance assumption been met.

As shown in Tables 4 and 5 earlier, the ANOVA's performed with the sample containing both males and females produced a greater number of significant F values than the ANOVA's conducted with males and females separated. The separate analyses by sex were performed in order to account for the possibility that the significant differences among clusters in the total sample were the result of sex differences rather

than differences associated with more intrinsic characteristics of the occupation clusters. The results suggest that sex differences may indeed have contributed to some of the differences among clusters. However, it is also possible that the restriction of range in occupations and the reduction in degrees of freedom associated with the separation of the sexes contributed to the decrease in the number of significant F values. For example, the finding that the OVIS scale titled "Nursing and Related Technical Services" was significant only in the female sample is not surprising, since there were no male incumbents in the three occupations for which this scale was most relevant (Nurse, Licensed Practical Nurse, and Nurse Aide). Thus, the removal of females from the total sample probably reduced the ability of this scale to discriminate among clusters. This kind of effect would seem most likely to occur with the OVIS scales, since these scales are more closely linked than the MIQ scales to the content of occupations.

Hypothesis Two

The second hypothesis pertained to the discriminability of OAI-derived occupational clusters in terms of the 22 SVIB basic scale scores of job incumbents. The tests for this hypothesis were similar to those for Hypothesis One. One-way ANOVA's were performed treating two different sets of occupational clusters as classification variables and the mean SVIB basic scale scores of incumbents in occupations as dependent variables. In all, 44 univariate ANOVA's were performed: 22 for each of the two sets of occupational clusters. Multivariate analysis of variance was not used in testing Hypothesis Two because of the small cluster n's in relation to the number of dependent variables.

The results of these analyses were not as encouraging as those obtained from the analyses of the OVIS and MIQ data. Only 12 of the 22 Strong basic scales were significant ($p < .01$) in the analyses for one or both sets of clusters; the remaining 10 scales failed to reach significance in either analysis. Interestingly, the clusters based on the job factors were more frequently discriminable (10 significant F values) than those based on the attribute factors (4 significant F values). (See Tables 6 and 8.)

At least two factors may have operated to attenuate the discrimination among clusters based on SVIB basic scales. First, the occupational descriptions used by the OAI raters were in many cases inadequate; for several occupations only DOT descriptions were available, in lieu of the longer and more complete USES descriptions used for other occupations. (See Riccobono and Cunningham, 1971a, for a discussion of the USES descriptions.) Secondly, it was often difficult to match specific DOT titles with the rather broad Strong occupational titles. The Strong titles often referred to occupational categories within which considerable variation might occur. For example, one of the occupational titles for which SVIB data were available was "Engineer." The Dictionary of Occupational Titles, on the other hand, divides engineering into several

different fields, and an OAI rating was obtained on a USES description for only one of these fields (Electrical Engineering). This problem was encountered in varying degrees with most of the occupations in the Strong sample.

Possible attenuating factors notwithstanding, it must be concluded from the analyses of the SVIB data that Hypothesis Two was only partially supported.

Hypothesis Three

The tests for the third hypothesis employed OAI-derived occupational clusters as a classification variable and distance scores between occupations as a dependent variable. As indicated earlier, the clusters were derived from the OAI job factor profiles of the occupations in the Strong sample, and the distance scores were computed from the appropriate SVIB occupational item-key profiles. It was predicted that distance scores between occupations within clusters would be smaller than distance scores between occupations from different clusters.

That this prediction held in four out of five analyses performed (Table 10) lends strong support to Hypothesis Three. It should be noted that the potentially attenuating factors described above in connection with Hypothesis Two might also have operated against Hypothesis Three.

Comments Concerning the Occupational Clusters

The reader is cautioned that occupational clusters were derived in this study solely for the purpose of the statistical analyses performed in connection with Hypotheses One through Three. Since these clusters were based on small samples of diverse occupations, they are not recommended for any use other than research. Any attempt at occupational clustering for educational (or other applied) purposes should draw systematically from the domain of occupations in question. Thus, if the domain of interest were the total population of occupations in the economy, a large and representative sample of occupations should be drawn on a stratified basis. If, on the other hand, a more limited domain of occupations were of interest for some specified purpose, the occupations to be compared and grouped should be drawn systematically from the defined occupational subset.

It can be claimed, however, based on the results associated with Hypotheses One through Three, that the OAI work dimensions (factors) have shown some validity for clustering purposes insofar as measured interests and needs are concerned, and that further research and development with these dimensions is warranted. A subsequent effort in the Ergometric Program will involve the derivation of occupational clusters based upon OAI ratings of a large, representative sample of occupations (see Cunningham et al., 1971).

Validation of the OAI Interest- and Need-Requirement Estimates

The second purpose of this study was to investigate the validity of the OAI interest- and need-requirement estimates for occupations. Hypotheses Four, Five, Six, and Seven were tested for this purpose.

Hypothesis Four

The fourth hypothesis held that OAI-derived estimates of the interest and need requirements of occupations would correlate significantly with the corresponding average OVIS interest scores and MIQ need scores of incumbents in those occupations. This prediction was based on the assumption that individuals tend to gravitate to and remain in work environments that are compatible with their interests and needs.

The correlations between the OAI interest-requirement estimates and the average OVIS scores for a sample of 43 occupations provide some support for Hypothesis Four. Of the 24 correlations computed, 15 are statistically significant in the predicted direction (Table 11). Five of the nine scales for which positive results were not obtained do not appear to be particularly relevant to the occupations in the sample; the correlations for these scales may have been attenuated by restriction of range. These scales are: Inspecting-Testing, Skilled Personal Services, Artistic, Music, and Entertainment. One of these five scales, Skilled Personal Services, has a significant negative correlation for which there is no apparent explanation. The remaining four scales that failed to show positive results appear to be relevant to at least some of the occupations in the sample. The low correlations for these scales might have resulted from invalid attribute-requirement estimates for the occupations or from a failure of the basic assumption that the average interest profiles of incumbents in an occupation reflect the occupation's reinforcement characteristics.

Of the 15 correlations computed between the OAI need-requirement estimates and the average MIQ scores for 41 occupations, 9 were statistically significant (Table 12). However, only three of these significant correlations were in the predicted direction; contrary to Hypothesis Four, the remaining six were significant negative correlations. Following the assumption that individuals tend to gravitate to and remain in work environments that are compatible with their needs, the investigators had reasoned that the MIQ scores of incumbents in occupations should correlate positively with the OAI need-requirement (reinforcer) estimates for the occupations. Implicit in this line of reasoning was the assumption that the MIQ measures chronic need states of the individual that are relatively unaffected by the work environment. Thus, the rationale for Hypothesis Four centered upon the concept of stable attributes of the individual (e.g., needs) as determinants of his adjustment to the environment.

Faced, however, with results that actually conflicted with Hypothesis Four, the investigators felt obliged to undertake a new line of reasoning that might explain these findings. An alternative assumption from which such an *a posteriori* explanation might proceed is that some of the needs measured by the MIQ are not entirely stable but are, in fact, at least partially dependent upon situational variables. Specifically, it might be expected that certain MIQ needs, especially the more basic ones in relation to Maslow's hierarchy, would become stronger under deprivation. For such needs, one might predict negative correlations between the OAI need-requirement estimates for occupations and the average scores of incumbents on corresponding MIQ need scales, since, if the OAI estimates are valid, deprivation should increase as the estimated need requirements (reinforcers) for occupations decrease.

Before this revised hypothesis could be tested, it was necessary to identify the MIQ needs that should increase under deprivation. Alderfer's E.R.G. theory was selected for this purpose. Under this theory, human needs are divided into three categories: Existence, Relatedness, and Growth. According to Alderfer, deprivation in relation to the existence and relatedness needs leads to an increase in their strength, while deprivation in relation to the growth needs leads to an increase in the strength of more basic (relatedness) needs. Conversely, satisfaction in relation to the existence and relatedness needs leads to an increase in the strength of higher-order needs (relatedness and growth, respectively), whereas satisfaction in relation to the growth needs leads to an increase in the strength of these needs. Reasoning from Alderfer's propositions, one would predict that for the existence and relatedness needs the OAI need-requirement (reinforcer) estimates for occupations would correlate negatively with the corresponding MIQ need scores of incumbents in the occupations, but for the growth needs these correlations would be positive.

In order to determine whether the previously obtained correlations conform with these predictions, the investigators classified the MIQ scales into Alderfer's three need categories, without referring to the correlations associated with these scales. The resulting classifications are shown in Table 20, where all but three of the MIQ scales are assigned to E.R.G. categories. Table 21 presents the 15 correlations (from Table 12) between OAI need-requirement estimates and average MIQ scores under the appropriate E.R.G. categories. It can be seen that all but one of the correlations are in the directions predicted from Alderfer's theory, and that this one conflicting correlation (for the Authority scale) is not statistically significant. The two scales that were not assigned to E.R.G. categories, Variety and Activity, both had negative correlations. If these two needs were classified as more basic than growth needs--which, after the fact, seems reasonable--negative correlations would be appropriate.

Because of the *a posteriori* nature of the preceding exercise, the finding that the E.R.G. predictions fit the present data cannot be offered as strong support for the validity of the OAI need-requirement estimates.

Table 20. Classification of the MIQ Need Scales Under Alderfer's E.R.G. Categories

Existence	Relatedness	Growth	Unclassified
Compensation	Advancement	Ability Utilization	Variety
Security	Authority	Achievement	Activity
Working Conditions	Independence	Creativity	Moral Values*
Company Policies and Practices	Recognition	Responsibility	
	Social Status	Social Service	
	Co-Workers*		
	Supervision-Tech.*		
	Supervision- H.R.*		

*Scales not included in the analysis.

Table 21. Correlations Between the OAI Need-Requirement Estimates for 41 Occupations and the Mean Need Scores of Incumbents by E.R.G. Category

Scale	N = 41
Existence	
Compensation	-.48*
Security	-.30*
Working Conditions	-.43*
Relatedness	
Advancement	-.20
Authority	.14
Independence	-.60*
Recognition	-.29
Social Status	-.30*
Growth	
Ability Utilization	.10
Achievement	.13
Creativity	.64*
Responsibility	.49*
Social Service	.44*
Unclassified	
Variety	-.22
Activity	-.39*

*$p < .05$

Nevertheless, it is encouraging that the obtained correlations appear to reflect more than random relationships between occupational variables and need scores of incumbents. Future investigations of the reinforcement characteristics of occupations will require a more rigorous theory of human needs and their relationships to the environment than was employed in the present study.

Hypothesis Five

Hypothesis Five stated that there would be significant relationships between the OAI need-requirement (reinforcer) estimates for occupations and the MSQ satisfaction scores of incumbents in the occupations, and that these relationships would be moderated by the incumbents' MIQ need scores. More specifically, in a two-by-two ANOVA design with OAI need-requirement estimates for occupations serving as one independent variable, MIQ need scores of job incumbents as the second independent variable, and MSQ satisfaction scores of incumbents as the dependent variable, it was predicted that the following effects would be significant: (a) the main effect for the OAI need-requirement estimate, (b) the interaction between the OAI need-requirement estimate and the MIQ need score, and (c) the simple main effect of the OAI need-requirement estimate within the group of incumbents with high scores on the corresponding MIQ need scale (i.e., the comparison between the high-need, high-reinforcement group and the high-need, low-reinforcement group). A separate ANOVA was performed for each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ satisfaction scale.

The results supported Hypothesis 5a in 8 of the 15 analyses (Table 13), Hypothesis 5b in 3 of the analyses (Table 14), and Hypothesis 5c in 10 of the analyses (Table 16).[7] Thus, in 10 of 15 cases (i.e., the 10 cases where Hypothesis 5c was supported), the results were consistent with the primary assumption underlying Hypothesis Five; namely, that an individual who is both high on a particular need and employed in an occupation that provides high reinforcement for that need is in a congruent (or satisfying) situation, while an individual who is high on a need but employed in an occupation that is low on reinforcement for that need is in an incongruent (or unsatisfying) situation. A second assumption associated with Hypothesis Five was that the reinforcement characteristics of the work environment in relation to a particular need are more highly related to satisfaction among persons who are high than those who are low on that need. The hypothesis derived from this assumption, Hypothesis 5b, was supported in only three cases: Advancement, Authority, and Social Status. For these three needs, the reinforcement x need

[7]Although only seven tests of simple main effects were performed within each need level (Table 16), it is assumed that Hypothesis 5c is supported in three additional cases where the main effect for the OAI need-requirement estimate was significant and the interaction effect did not approach significance.

interaction was significant, and the difference between the low- and high-reinforcement means was greater for the high-need than for the low-need group. (See Tables 14 and 16.) In two additional cases (Ability Utilization and Activity), where the reinforcement x need interaction approached significance ($p < .20$), the simple main effect for reinforcement (OAI need-requirement estimate) was significant in the high-need group and not significant in the low-need group. Therefore, in 5 of 15 cases the results were consistent with the assumption that the reinforcement characteristics of the work environment are more highly related to satisfaction among high-need than low-need workers. In those instances where the main effect for reinforcement was significant in the predicted direction and the reinforcement x need interaction did not approach significance, it was assumed that the reinforcement effect was the same for both the high- and low-need incumbents; simple main effects were not tested in those cases.

In summary, the prediction that the high-need, high-reinforcement group would have a higher average satisfaction score than the high-need, low-reinforcement group was supported in 10 of 15 cases, while the prediction that the relationships between OAI-derived reinforcement (need-requirement) estimates and satisfaction scores would be stronger for the high-need than for the low-need group was supported in only 5 of the 15 cases. Thus, there is substantial support for the general hypothesis of significant relationships between the OAI need-requirement (reinforcer) estimates for occupations and the MSQ (satisfaction) scores of job incumbents, but considerably weaker support for the hypothesis that these relationships would be moderated by the incumbents' MIQ need scores. The results allow the conclusion that there is some validity in 10 of the OAI need-requirement estimates.

Hypothesis Six

Hypothesis Six predicted that general satisfaction, as measured by the MSQ, would be positively related to the degree of congruence between the worker's MIQ need profile and the OAI need-reinforcer profile of his occupation. The results are indeed consistent with this prediction; all three comparisons of mean satisfaction between the low- and high-congruence groups were statistically significant. It must be noted, however, that these analyses were conducted without regard to the identity of the workers' occupations, thus allowing the possibility of disproportionate representation of some occupations (in terms of numbers of workers) in the low- and high-congruence groups. To the extent that such unequal representation occurred, the differences between the low- and high-congruence groups might reflect differences in the satisfaction potential of various occupations for a fixed (or average) worker, rather than differences among individuals in satisfaction derived from fixed occupations.

Although these findings, in conjunction with those reported for Hypothesis Five, lend encouragement to the prospect of relating worker needs to occupational reinforcements, the demonstrated relationships

are crude ones. The OAI need-reinforcer estimates are in their research stage and must undergo further development and validation. (The low correlations between the OAI need-reinforcer estimates and corresponding ORP estimates--discussed below--are somewhat disconcerting.) In addition, the congruence index used in this study represents only an initial attempt at relating individual need profiles to occupational reinforcer profiles and will need considerable refinement.

Hypothesis Seven

The final hypothesis in this study predicted significant correlations between the OAI need-requirement (reinforcer) estimates for a sample of occupations and the corresponding ORP (Occupational Reinforcer Pattern) estimates from the Minnesota Work Adjustment Project. Although this prediction held for 9 of the 15 needs, only three of the significant correlations exceeded .50 (Table 19). Thus, it must be concluded that the two procedures for deriving reinforcement estimates for occupations do not yield identical results. Nevertheless, the obtained correlations do provide some support for the validity of 9 of the 15 OAI need-requirement estimates.

Conclusions

The results of this study offer rather consistent support for the validity of the OAI occupational descriptors. Hypotheses One, Three, Five, Six, and Seven were supported by the majority of the statistical tests performed, and Hypothesis Two was at least partially supported. Hypothesis Four received substantial support in the case of OVIS scores and little support from MIQ scores, although revised predictions concerning the correlations between OAI need-requirement estimates and MIQ scores were consistent with the obtained correlations.

Based on these results, it can be concluded that the OAI work-dimension scores and attribute-requirement estimates for occupations possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents. Accordingly, these variables should prove useful in research dealing with human behavior in relation to the characteristics of the work environment. Moreover, it is reasonable to expect that with further development, the OAI variables will prove applicable to a number of educational problems. The further development and potential applications of a descriptive and classificatory system based on the Occupation Analysis Inventory are discussed in a report by Cunningham *et al.* (1971).

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APPENDICES

APPENDIX A

OCCUPATIONAL SAMPLES

Test Sample

	Title	DOT Code
1.	Assembler, Electrical Controls	729.884
2.	Assistant Branch Manager, Bank	186.138
3.	Audit Clerk	210.388
4.	Bookkeeping Machine Operator	215.388
5.	Carpenter (apprentice)	860.381
6.	Case Worker	195.108
7.	Chemist, Organic	022.081
8.	Clerk, General Office	219.388
9.	Corrections Officer	372.868
10.	Draw Frame Tender	680.885
11.	Electronics Technician	003.181
12.	Engineer, Electrical	003.081
13.	File Clerk	206.388
14.	Firefighter	373.884
15.	Fish and Game Warden	379.168
16.	Key Punch Operator	213.582
17.	Lab Tester II	029.381
18.	Librarian	100.168
19.	Licensed Practical Nurse	079.378
20.	Loom Fixer	683.280
21.	Machinist	600.280
22.	Manager, Branch Bank	186.118
23.	Manager, Motel	187.118
24.	Manager, Newspaper Circulation	163.118
25.	Manager, Retail Food Store	185.168
26.	Manager, Theater	187.168
27.	Mason (apprentice)	861.381
28.	Nurse Aide	355.878
29.	Nurse, General Duty	075.378
30.	Order Filler	249.368
31.	Patrolman	375.268

	Title	DOT Code
32.	Production Machine Operator	609.885
33.	Programmer, Business	020.188
34.	Psychologist	045.108
35.	Salesman, Life Insurance	250.258
36.	Salesman, Real Estate	250.358
37.	Secretary	201.368
38.	Shipping Clerk II	222.587
39.	Spinner, Frame	682.885
40.	Stock Clerk	223.387
41.	Teacher, Elementary	092.228
42.	Teller, Bank	212.368
43.	Tobacco Grower	405.181
44.	Typist	203.558
45.	Welder, Combination	812.884
46.	Wood Technologist	040.081
47.	Yarn Winder	681.885

Strong Sample

	Title	DOT Code
1.	Accountant	160.188
2.	Advertising Man	164.068
3.	Architect	001.081
4.	Artist	144.081
5.	Author	130.088
6.	Banker	186.118
7.	Biologist	041.081
8.	Carpenter	860.381
9.	Chamber of Commerce Executive	187.118
10.	Chemist	022.081
11.	Clerk, General Office	219.388
12.	Community Recreation Administrator	187.118
13.	Credit Manager	168.168
14.	Dentist	072.108
15.	Engineer	003.081
16.	Farmer	406.181
17.	Forest Service Man	441.384
18.	Lawyer	110.108
19.	Librarian	100.168
20.	Manager, Production	183.118
21.	Manager, Sales	163.118
22.	Mathematician	020.088
23.	Minister	120.108
24.	Mortician	187.168
25.	Musician, Performer	152.048
26.	Osteopath	071.108
27.	Personnel Director	166.118
28.	Pharmacist	074.181
29.	Physical Therapist	079.378
30.	Physician	070.108
31.	Physicist	023.081

	Title	DOT Code
32.	Policeman	375.268
33.	President, Manufacturing Concern	189.118
34.	Printer	973.381
35.	Programmer	020.188
36.	Psychiatrist	070.108
37.	Psychologist	045.108
38.	Public Administrator	188.118
39.	Purchasing Agent	162.158
40.	Rehabilitation Counselor	045.108
41.	Salesman, Life Insurance	250.258
42.	Salesman, Real Estate	250.358
43.	School Superintendent	091.118
44.	Social Worker	195.108
45.	Teacher, Business Education	091.228
46.	Teacher, Music	152.028
47.	Teacher, Social Science	091.228
48.	Veterinarian	073.108
49.	YMCA Secretary	195.118

ORP Sample

	Title	DOT Code
1.	Accountant	160.188
2.	Accounting Clerk	219.488
3.	Automobile Body Repairman	807.381
4.	Automobile Mechanic	620.281
5.	Automobile Service Station Attendant	915.867
6.	Baker	526.781
7.	Carpenter	860.381
8.	Case Worker	195.108
9.	Claims Adjuster	241.168
10.	Clerk, General Office	219.388
11.	Cook	313.381
12.	Cosmetologist	332.271
13.	Dietitian	077.168
14.	Draftsman, Mechanical	001.281
15.	Electrical Technician	003.181
16.	Electrician	824.281
17.	Electronics Mechanic	828.281
18.	Engineer, Stationary	950.782
19.	Firefighter	373.884
20.	Librarian	100.168
21.	Machinist I	600.280
22.	Maintenance Man, Factory or Mill	899.281
23.	Meat Cutter	316.884
24.	Medical Technologist	078.381
25.	Nurse Aide	355.878
26.	Nurse, General Duty	075.378
27.	Nurse, Licensed Practical	079.378
28.	Occupational Therapist	079.128
29.	Operating Engineer II	859.883
30.	Painter, Maintenance	840.781
31.	Patrolman	375.268

	Title	DOT Code
32.	Pharmacist	074.181
33.	Physical Therapist	079.178
34.	Pipe Fitter, Maintenance	862.381
35.	Programmer, Business	020.188
36.	Punch-Press Operator	615.782
37.	Radiologic Technologist	078.368
38.	Salesman, Driver	292.358
39.	Salesman, Real Estate	250.358
40.	Salesperson, General	289.458
41.	Sheet Metal Worker	804.281
42.	Teacher, Elementary School	092.228
43.	Teacher, Secondary School	091.228
44.	Teller	212.368
45.	Tractor-Trailer Truck Driver	904.883
46.	Typist	203.588
47.	Waitress	311.878
48.	Welder, Combination	812.884

APPENDIX B

Procedure for Obtaining Independent Variables

The flow chart on page 101 depicts the matrix manipulations required to obtain the independent variables used in the study. Each of these matrices is defined below.

J_1 -- Raw ratings of 822 jobs on the 622 items of the OAI.

A_1 -- Raw average ratings (weights) of 103 ARI attributes on the 622 items of the OAI.

A_1' -- Transpose of A_1.

J_2 -- Factor loading matrix based on factor analyses of OAI items intercorrelated on the basis of job ratings. (90 factors x 624 OAI items)

A_2 -- Factor loading matrix based on factor analyses of OAI items intercorrelated on the basis of attribute ratings. (86 factors x 624 OAI items)

J_3 -- Transformed factor loading matrix. The transformation involved establishing 11 equal intervals based on Fisher's z's in an r to z transformation table. Each of these intervals was then assigned an arbitrary weight ranging from 0 to 11. Thus, a factor loading less than .28 was transformed to 0, a loading from .28 to .435 was transformed to 1, and so on, to the final interval which transformed a loading greater than .970 to 11.

A_3 -- Transformed factor loading matrix. The same procedure was used as in transforming J_2 to J_3.

J_4 -- Factor score matrix for jobs based on factors in J_2 matrix. (90 factors x 822 jobs)

A_4 -- Factor score matrix for jobs based on factors in the A_2 matrix. This matrix is the product of the matrix multiplication of $(A_3 \cdot J_1)$. The order of A_4 is 86 factors x 822 jobs.

J_5 -- Sum of cross products of item attribute weights by transformed factor loadings, multiplying J_3 by A_1. The order of J_5 is 90 factors x 103 attributes.

A_5 -- Sum of cross products of item attribute ratings by transformed factor loadings. This matrix is the product of A_3 and A_1. The order of A_5 is 86 factors x 103 attributes.

J_{5t} -- Attribute scores for factors. J_{5t} is derived from J_5 by dividing each entry in a J_5 row by the number of nonzero loadings in the corresponding J_3 row.

J_{5t}' -- Transpose of J_{5t}.

A_{5t} -- Attribute scores for factors. A_{5t} is derived from A_5 by dividing each entry in an A_5 row by the number of nonzero loadings in the corresponding A_3 row.

A_{5t}' -- Transpose of A_{5t}.

J_6 -- Attribute scores for jobs. J_6 is the product of J_{5t}' and J_4. The order of J_6 is 103 attributes x 822 jobs. (Note--In performing this multiplication, before summing, all negative products in the matrix multiplication were transformed to zero. This was done to avoid negative attribute estimates for jobs.)

A_6 -- Attribute scores for jobs. A_6 is the product of A_{5t}' and A_4. (See note above.) The order of A_6 is 103 attributes x 822 jobs.

J_{6z} -- Z-score transformation of J_6. Z-scores are based on the mean and standard deviation of the row in which a J_6 entry appears.

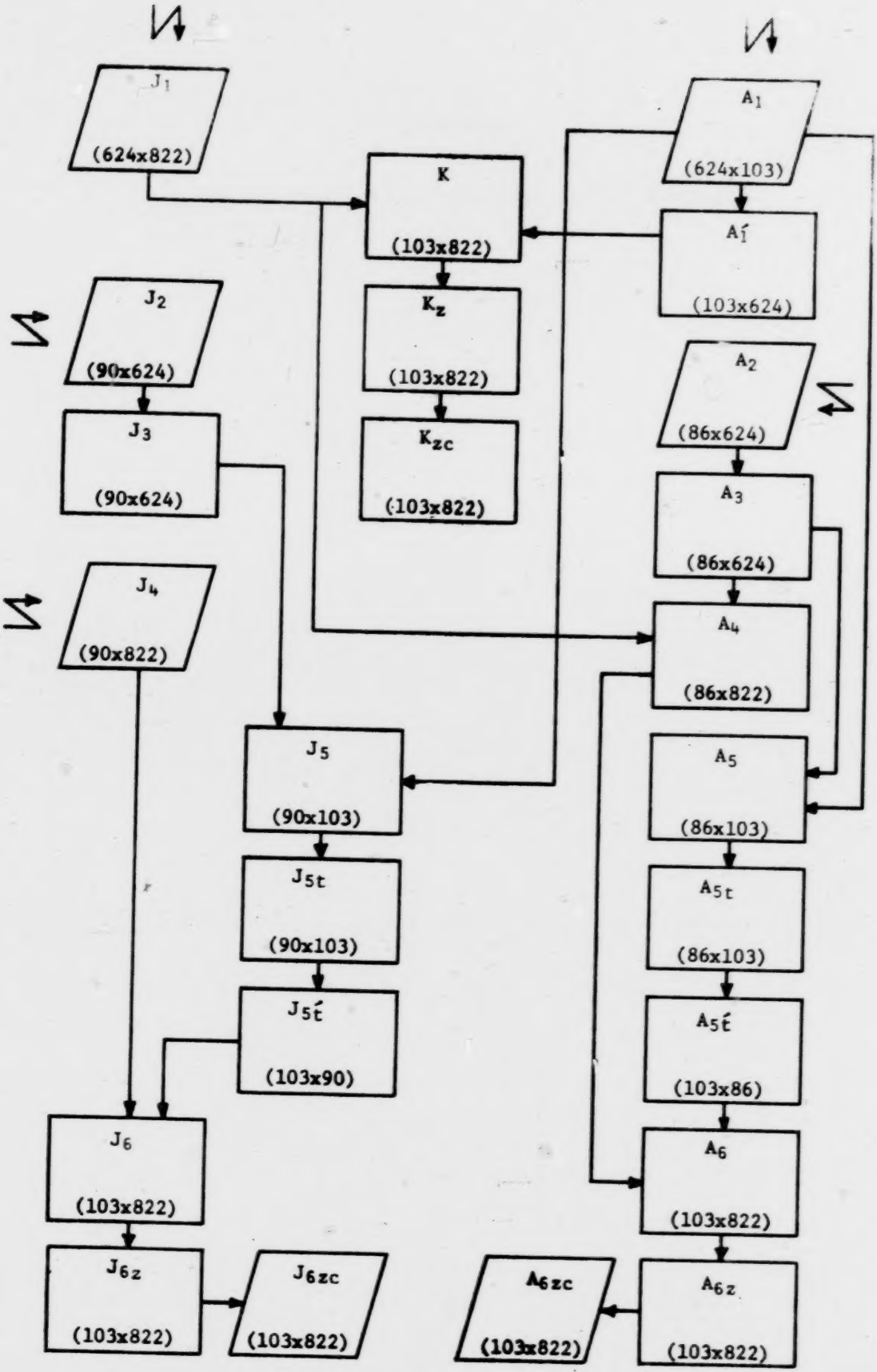
A_{6z} -- Z-score transformation of A_6.

J_{6zc} and A_{6zc} -- Result of adding the constant 9 to each entry in J_{6z} and A_{6z}. This operation eliminates negative Z-scores.

K -- Attribute requirement matrix based on items. K is the product of J_1 and A_1'. The order of K is 103 attributes x 822 jobs.

K_z -- Z-score transformation of K, where transformation is computed by rows.

K_{zc} -- $K_z + 9$.


J1
(624x822)
K
(103x822)
A1
(624x103)
Aí
(103x624)
J2
(90x624)
Kz
(103x822)
A2
(86x624)
J3
(90x624)
Kzc
(103x822)
A3
(86x624)
J4
(90x822)
A4
(86x822)
J5
(90x103)
A5
(86x103)
J5t
(90x103)
A5t
(86x103)
J5t́
(103x90)
A5t́
(103x86)
J6
(103x822)
A6
(103x822)
J6z
(103x822)
J6zc
(103x822)
A6zc
(103x822)
A6z
(103x822)

APPENDIX C

BREAKDOWN OF TEST SAMPLE BY MAJOR CENSUS CATEGORIES

Table 22. Breakdown of Test Sample by Major Census Categories

Category	Expected No.[1]		Actual No.	
Professional, technical and kindred	6		11	
Managers, officials, and proprietors, except farm	5		6	
Clerical and kindred	8		10	
Sales	3		2	
Total White Collar		22		29
Craftsmen, foremen and kindred	6		4	
Operatives and kindred	8		5	
Laborers, except farm and mine	2		2	
Total Blue Collar		16		11
Private household workers	1		--	
Service workers, except private household	4		6	
Total Service		5		6
Farmers, farm managers	2		1	
Farm laborers, foremen	2		--	
Total Farm		4		1
Total--All Occupations		47		47

[1]Expected Number based on projections of the distribution of the 1970 work force reported in Matthews (1968).

APPENDIX D

WORKER INFORMATION QUESTIONNAIRE

CONFIDENTIAL

Your statements on this form and your answers to all other questions will remain strictly confidential.

Code Number_____

1. Today's Date _____ 19__
2. Sex: (Check one) _____ Male _____ Female
3. When were you born? _____ 19__
4. Circle the number of years schooling you completed in each:

   Elementary, Jr. High and High School 4 5 6 7 8 9 10 11 12

   Technical School 0 1 2 3 4

   College 0 1 2 3 4

   Graduate or Professional School 0 1 2 3 4 5
5. Did you receive specific vocational training for a particular occupation? If so, what occupation? _____
6. Did you receive apprentice or on-the-job training for your present position? If so, how long did it last?

   _____ None required

   _____ Less than 1 month

   _____ 1 to 3 months

   _____ 4 to 12 months

   _____ over 12 months
7. What is your present job title? _____
8. How long have you been on your present job? _____ Years _____ Months
9. What would you call your occupation, your usual type of work?

   _____
10. How long have you been in this type of work? _____ Years _____ Months

APPENDIX E

TESTING INSTRUCTIONS

First of all, let me thank you for your willingness to participate in this research project. As a representative of your occupational group, your responses will be used to assist individuals who are making vocational decisions to be better able to decide on their career plans and objectives. Therefore, it is very important that you answer all these questions as candidly and as honestly as you can. All of your responses will remain strictly confidential, and what you say will have no effect whatsoever on your present job. The scores which are returned to your company or organization will be identified only by code number, and there will be no way that a score can be linked with a particular individual. However, the information which you give will be the information which students receive concerning the likes and dislikes of successful people in your occupation; therefore, it is very important that you give your true feelings.

You will be asked to complete a short information sheet and three questionnaires. The information sheet is the Worker Information Questionnaire. The questionnaires are the: (1) Minnesota Satisfaction Questionnaire; (2) Ohio Vocational Interest Survey; and (3) Minnesota Importance Questionnaire. PASS OUT QUESTIONNAIRES AND ANSWER SHEETS.

You should now have the three questionnaire booklets, a copy of the Worker Information Questionnaire, and three answer sheets. If you do not have these, raise your hand. You will notice a code number stamped in red on the top right of your Worker Information Questionnaire. This same code number should be stamped in the name section of each of the three answer sheets which you have. Please check each of your answer sheets to make sure you find this number. If not, raise your hand. This is the number which will be used to identify your scores

Please fill out the information requested on the Worker Information Questionnaire. On the bottom of this sheet please write the name of your company or organization

The first inventory you will be asked to complete is the Minnesota Satisfaction Questionnaire. You will notice that the first page as you open the booklet is an information sheet. Do not fill this in. The instructions appear on page two. Please follow these instructions with the exception that you record your answers on the red answer sheet instead of marking them in the test booklet. This red answer sheet has blocks labeled A-B-C-D-E. The item responses in the booklet are numbered 1-2-3-4-5. Over these numbers in the booklet you will find, stamped in red, the letters A-B-C, etc. Thus, if your response to a question is 1,

then you should blacken the A on your answer sheet; if it is 2, blacken the B; 3, the C; and so on. Also please notice that the items in this questionnaire pertain to your satisfaction with your present job.

The second inventory is the Ohio Vocational Interest Survey. Its answer sheet is the dark blue one. The instructions appear in the test booklet on page 6. When you begin to answer the items, start on the answer sheet where the box says, "Begin page 6 here." You will notice that the answer sheet lines up with the test booklet, so if you fold the booklet and lay it over the answer sheet, it is very easy to keep your place. (DEMONSTRATE)

The third questionnaire is the Minnesota Importance Questionnaire. Its answer sheet is the light blue one. The instructions for this questionnaire appear in the test booklet and are self-explanatory. As you respond to the items, you will see the same statement repeated several times. However, each pair of statements is unique. That is, the same pair of statements is never repeated. Also, please note that the questions in this questionnaire apply to your ideal job, instead of your present job. That is, as one man stated, the job which you dream about.

Please make no marks in the test booklets. When you erase on the answer sheets, erase completely. Work as rapidly as you can, but please respond to all items. You need not fill out any of the information requested in the name blocks on the answer sheets; fill out only the Worker Information Questionnaire.

Please place your booklets in the following order and work in this order:

1. Minnesota Satisfaction Questionnaire
2. Ohio Vocational Interest Survey
3. Minnesota Importance Questionnaire

Most people are able to finish in less than two hours.

Are there any questions?

Begin!

APPENDIX F

OCCUPATIONAL CLUSTERS FOR TEST SAMPLE

Table 23. Clusters Based on Second-Order Factors - Test Sample

Cluster 1	Cluster 2	Cluster 3
Nurse	Draw Frame Tender	Programmer
Nurse Aide	Spinner	Librarian
L.P.N.	Production Machine Operator	Elementary Teacher
	Winder Tender	
	Loom Fixer	
Cluster 4	**Cluster 5**	**Cluster 6**
Key Punch Operator	Order Filler	Electrical Engineer
General Office Clerk	Packer	Electronics Technician
Secretary	Stock Clerk	
Typist	File Clerk	
Cluster 7	**Cluster 8**	**Cluster 9**
Chemist	Bookkeeping Machine Operator	Newspaper Circ. Mgr.
Wood Technologist	Audit Clerk	Supermarket Manager
Chemical Technician	Teller, Bank	Real Estate Salesman
		Motel Manager

Table 24. Clusters Based on Attribute Factors - Test Sample

Cluster 1	Cluster 2	Cluster 3
Chemist	Nurse	Bookkeeping Machine Operator
Wood Technologist	L.P.N.	Audit Clerk
Chemical Technician		Teller, Bank
		General Office Clerk
Cluster 4	**Cluster 5**	**Cluster 6**
Draw Frame Tender	Newspaper Circ. Mgr.	Key Punch Operator
Spinner	Supermarket Manager	Secretary
Production Machine Operator	Motel Manager	Typist
Winder Tender	Branch Bank Manager	File Clerk
Cluster 7	**Cluster 8**	**Cluster 9**
Corrections Officer	Order Filler	Librarian
Firefighter	Packer	Elementary Teacher
Patrolman	Stock Clerk	
Cluster 10		
Psychologist		
Computer Programmer		

Table 25. Clusters Based on Job Factors - Test Sample

Cluster 1	Cluster 2	Cluster 3
Electrical Engineer	Chemist	Nurse
Electronics Technician	Wood Technologist	Nurse Aide
	Chemical Technician	L.P.N.
Cluster 4	**Cluster 5**	**Cluster 6**
Bookkeeping Machine Operator	Draw Frame Tender	Psychologist
Programmer	Spinner	Case Worker
Audit Clerk	Production Machine Operator	Elementary Teacher
Teller, Bank	Winder Tender	
	Loom Fixer	
	Assembler	
Cluster 7	**Cluster 8**	**Cluster 9**
Newspaper Circ. Mgr.	Key Punch Operator	Real Estate Salesman
Supermarket Manager	General Office Clerk	Branch Bank Manager
Librarian	Secretary	Life Insurance Mgr.
Motel Manager	Typist	
Cluster 10	**Cluster 11**	
Corrections Officer	Order Filler	
Patrolman	Packer	
	Stock Clerk	
	File Clerk	

APPENDIX G

MEANS, F VALUES, AND STANDARD DEVIATIONS FOR ANALYSES OF VARIANCE OF OVIS (INTEREST) AND MIQ (NEED) SCORES ACROSS THREE SETS OF OAI-DERIVED OCCUPATIONAL CLUSTERS

Table 26. Mean Interest Scores for Job Clusters

Scale	1 N=50	2 N=46	3 N=60	4 N=67	5 N=153	6 N=90	7 N=100	8 N=98	9 N=43	10 N=16	11 N=63	$F^1(6,779)$	$F^2(10,775)$
Manual Work	18.56	20.39	19.50	18.23	23.20	18.33	20.43	18.71	19.74	22.87	23.61	8.62**	6.35**
Machine Work	29.18	28.80	19.90	19.56	28.18	22.53	26.76	18.96	24.65	33.68	26.39	11.76**	14.34**
Personal Service	20.00	19.45	25.06	23.67	27.08	2[illegible].04	24.28	24.92	22.74	25.62	28.73	4.86**	7.27**
Care of People-Animals	24.10	26.23	38.83	31.85	32.24	2[illegible].68	26.43	33.89	25.93	32.00	32.42	12.27**	15.06**
Clerical Work	20.08	22.39	27.53	30.19	31.90	24.56	26.20	33.11	22.69	31.25	32.76	5.97**	16.72**
Inspect. & Test.	22.56	24.58	22.33	21.52	29.88	21.92	25.76	22.46	22.93	31.25	29.87	17.96**	14.57**
Crafts	35.66	32.45	22.36	21.92	28.62	26.04	28.96	21.08	27.74	36.56	28.22	7.22**	16.94**
Customer Service	25.96	26.34	30.63	33.38	33.32	30.18	32.63	34.70	31.23	35.31	35.69	2.72*	7.53**
Nursing	22.10	23.21	43.06	29.83	30.92	26.32	25.18	32.13	24.37	26.50	30.50	25.22**	23.74**
Skilled Pers. Service	19.64	20.93	26.10	25.01	27.32	24.31	23.34	26.67	22.09	24.93	26.42	1.98	6.09**
Training	32.34	32.78	32.71	32.16	32.47	34.90	33.61	32.87	34.41	37.81	31.87	1.26	1.58
Literary	25.30	27.26	28.93	29.58	26.34	32.60	32.03	29.75	31.09	27.06	27.14	7.33**	5.27**
Numerical	33.50	35.80	23.78	32.97	28.22	29.94	31.91	27.97	33.55	31.12	29.22	6.10**	6.64**
Appraisal	36.08	38.58	26.18	27.98	28.66	31.23	33.88	26.60	33.09	33.62	30.26	4.50**	12.17**
Agriculture	34.70	35.21	25.61	24.13	29.71	29.43	31.88	24.65	32.32	37.87	30.00	4.06**	10.55**
Applied Technology	41.08	39.10	24.85	27.83	27.99	32.00	33.60	25.17	34.55	33.87	28.34	4.91**	17.73**
Promotion-Communication	30.42	31.15	30.43	31.68	28.45	35.43	35.95	32.55	37.65	34.68	29.95	10.50**	8.33**
Management	37.76	40.15	33.86	35.49	33.66	35.97	40.31	36.10	41.41	37.81	33.98	6.45**	7.68**
Artistic	28.40	31.39	30.43	32.73	29.76	34.01	33.10	33.63	30.90	27.81	30.01	2.73*	3.23**
Sales Represent.	34.62	32.89	26.65	27.71	29.60	29.11	32.50	27.98	37.81	30.93	32.17	3.64**	8.65**
Music	29.10	27.04	29.65	29.38	27.03	32.45	28.34	30.04	29.27	30.31	27.53	3.23**	1.97*
Entertainment	24.92	24.39	28.58	28.64	25.16	29.22	27.71	29.65	27.90	27.18	26.88	3.28**	2.88**
Teach.-Couns.-Soc. Work	32.58	35.95	34.35	34.58	31.78	38.90	34.97	35.48	38.55	36.25	31.57	6.47**	5.61**
Medical	27.76	28.89	34.68	26.71	26.19	28.17	25.94	26.34	28.65	26.25	25.79	6.83**	4.60**

[1]F based on seven clusters with 60 or more members.

[2]F based on all eleven clusters.

**p < .01
*p < .05

Table 27. Mean Need Scores for Job Clusters

Scale	1 N=50	2 N=46	3 N=60	4 N=67	5 N=153	6 N=90	7 N=100	8 N=:8	9 N=43	10 N=16	11 N=63	F^1 (6,779)	F^2 (10,775)
Ability Utilization	1.62	1.41	1.66	1.70	1.45	1.64	1.61	1.56	1.83	1.55	1.49	3.86**	2.11*
Achievement	1.81	1.61	1.75	1.72	1.48	1.73	1.65	1.72	1.98	1.61	1.71	3.63**	2.91**
Activity	0.01	-0.03	0.32	0.49	0.68	0.11	0.35	0.59	0.43	0.10	0.69	4.11**	7.57**
Advancement	1.75	1.53	1.43	1.76	1.57	1.32	1.71	1.79	1.83	1.45	1.77	5.16**	3.38**
Authority	0.19	-0.14	-0.08	-0.25	0.01	-0.12	0.26	-0.12	0.49	-0.26	0.09	1.97	3.82**
Comp. Pol. & Practices	1.06	0.99	1.25	1.54	1.23	1.39	1.21	1.36	1.10	1.26	1.25	1.37	2.35**
Compensation	1.24	1.21	1.05	1.31	1.27	0.94	1.16	1.47	1.27	1.30	1.56	4.57**	3.08**
Co-Workers	0.69	0.61	0.76	0.82	0.87	0.76	0.58	0.92	0.62	0.86	1.11	3.73**	3.37**
Creativity	1.29	1.11	1.24	1.11	0.94	1.41	1.48	1.08	1.54	0.81	1.02	8.60**	7.26**
Independence	-0.12	-0.37	-0.32	0.07	0.39	0.02	-0.13	0.41	0.12	-0.23	0.13	4.57**	7.80**
Moral Values	1.32	1.38	1.23	1.36	1.22	1.61	1.23	1.17	1.71	1.37	1.08	2.63*	1.96*
Recognition	1.28	1.02	1.00	1.23	1.04	1.00	1.15	1.33	1.21	1.08	1.42	4.46**	2.81*
Responsibility	1.27	1.03	1.04	1.02	0.86	1.22	1.37	1.11	1.52	0.80	0.98	6.38**	6.07**
Security	1.12	1.16	1.11	1.26	1.63	0.92	1.15	1.29	0.81	1.56	1.63	7.93**	7.03**
Social Service	0.74	0.66	1.61	1.25	1.19	1.18	1.18	1.17	1.43	1.50	1.36	4.39**	5.56**
Social Status	-0.12	-0.08	-0.16	-0.12	0.26	-0.07	0.06	0.05	0.65	0.56	0.45	2.77*	4.59**
Supervision-H.R.	0.92	1.16	1.13	1.20	1.19	1.03	1.10	1.19	1.10	1.15	1.18	0.70	0.91
Supervision-Tech.	0.54	0.56	0.91	0.91	1.06	0.61	0.78	0.92	0.81	1.08	1.07	3.12**	4.58**
Variety	0.27	0.25	0.47	0.50	0.49	0.46	0.59	0.60	0.65	0.22	0.71	1.33	1.91*
Working Conditions	0.86	0.83	1.20	1.18	1.41	1.12	1.04	1.35	0.76	1.22	1.37	2.35*	6.07**

[1]F Based on seven clusters with 60 or more incumbents.
[2]F Based on all eleven clusters.

**p < .01
*p < .05

Table 28. Mean Interest Scores for Attribute Clusters

Scale	1 N=46	2 N=97	3 N=89	4 N=51	5 N=77	6 N=132	7 N=130	8 N=96	9 N=68	$F_{(8,777)}$
Manual Work	20.39	20.88	18.30	22.13	21.09	18.47	22.17	22.23	18.17	5.30**
Machine Work	28.80	25.34	20.06	24.21	26.90	22.71	27.58	26.71	20.57	8.37**
Personal Service	19.45	24.79	23.33	27.45	25.16	23.00	25.68	26.19	23.17	4.51**
Care of People-Animals	26.23	34.49	32.02	32.70	25.84	29.87	31.49	32.22	28.29	7.74**
Clerical Work	22.39	26.63	29.88	33.19	25.76	28.53	30.55	28.72	25.85	6.46**
Inspecting & Testing	24.58	25.45	21.49	28.15	26.02	22.37	28.26	27.96	21.54	10.70**
Crafts	32.45	26.57	22.52	24.62	29.58	26.49	29.34	28.92	23.95	7.63**
Customer Service	26.34	29.81	33.07	32.92	33.27	31.28	34.16	33.33	31.77	4.66**
Nursing	23.21	35.58	31.14	31.58	25.59	27.66	29.66	29.27	25.35	10.50**
Skilled Pers. Service	20.93	24.49	25.05	28.29	23.14	24.11	26.62	25.34	24.22	3.67**
Training	32.78	33.15	33.03	29.31	34.55	32.75	34.05	33.66	32.73	2.12*
Literary	27.26	26.75	29.71	25.70	30.45	28.18	30.62	28.30	32.83	4.08**
Numerical	35.80	25.75	31.08	26.00	35.09	30.15	29.16	29.18	31.94	7.94**
Appraisal	38.58	27.63	28.11	25.17	35.02	30.24	31.48	31.03	30.60	11.30**
Agriculture	35.21	28.65	24.58	26.23	32.88	28.25	31.37	31.45	28.07	7.91**
Applied Tech.	39.10	27.86	27.77	23.84	35.12	31.12	30.46	30.59	31.07	9.95**
Promotion-Comm.	31.15	29.12	33.31	26.72	37.36	31.62	32.68	32.18	34.04	7.63**
Management	40.15	33.83	36.78	32.01	43.03	36.86	36.20	35.04	34.45	11.19**
Artistic	31.39	29.65	32.65	27.90	31.74	31.43	32.13	30.84	35.08	3.03**
Sales Represent.	32.89	27.98	27.74	26.96	35.87	30.71	30.50	31.69	30.77	7.59**
Music	27.04	28.94	29.78	25.62	27.77	29.89	28.69	28.14	32.85	2.38*
Entertainment	24.39	26.80	28.89	24.27	27.97	27.97	26.86	26.66	30.25	2.65**
Teach.-Couns.-Soc. Wk.	35.95	32.16	36.44	31.21	36.38	34.31	34.63	33.72	37.44	3.62**
Medical	28.89	30.61	28.23	24.62	27.06	26.50	27.30	27.63	25.48	2.59**

**$p < .01$
*$p < .05$

Table 29. Mean Need Scores for Attribute Clusters

Scale	1 N=46	2 N=97	3 N=89	4 N=51	5 N=77	6 N=132	7 N=130	8 N=96	9 N=68	$F_{(8,777)}$
Ability Utilization	1.41	1.56	1.65	1.48	1.68	1.61	1.48	1.54	1.76	2.05*
Achievement	1.61	1.64	1.72	1.50	1.76	1.79	1.52	1.75	1.75	2.59**
Activity	-0.03	0.48	0.40	0.54	0.45	0.40	0.47	0.58	0.14	3.67**
Advancement	1.53	1.48	1.70	1.48	1.90	1.81	1.54	1.67	1.35	4.28**
Authority	-0.14	0.12	-0.29	-0.20	0.42	0.07	0.00	0.08	-0.16	4.75**
Comp. Pol. & Pract.	0.99	1.24	1.41	1.22	1.21	1.25	1.19	1.46	1.23	2.04*
Compensation	1.21	1.13	1.25	1.12	1.26	1.41	1.26	1.39	0.96	2.24*
Co-Workers	0.61	0.82	0.80	0.90	0.51	0.86	0.77	0.98	0.75	3.13**
Creativity	1.11	1.21	1.11	0.79	1.54	1.24	1.08	1.14	1.36	5.98**
Independence	-0.37	0.00	0.04	0.43	-0.26	0.25	0.14	0.20	0.02	5.61**
Moral Values	1.38	1.17	1.29	1.38	1.36	1.18	1.22	1.49	1.51	1.21
Recognition	1.02	1.09	1.21	0.98	1.25	1.37	1.01	1.26	0.99	3.61**
Responsibility	1.03	1.11	1.05	0.66	1.49	1.23	0.97	1.08	1.18	6.71**
Security	1.16	1.27	1.20	1.66	1.07	1.22	1.40	1.47	0.90	4.29**
Social Service	0.66	1.46	1.16	1.12	1.21	0.99	1.23	1.42	1.28	5.39**
Social Status	-0.08	0.09	0.02	0.12	0.24	0.02	0.20	0.18	0.03	0.85
Supervision-H.R.	1.16	1.18	1.10	1.16	1.12	1.10	1.11	1.27	0.96	1.06
Supervision-Tech.	0.56	0.98	0.77	1.07	0.87	0.79	0.88	1.06	0.61	3.71**
Variety	0.25	0.57	0.48	0.47	0.62	0.54	0.40	0.68	0.39	1.86
Working Conditions	0.83	1.28	1.19	1.41	0.93	1.16	1.23	1.32	1.04	3.76**

**p < .01
*p < .05

Table 30. Mean Interest Scores for Second-Order Clusters

Scale	1 N=68	2 N=189	3 N=114	4 N=100	5 N=111	6 N=71	7 N=94	8 N=95	9 N=65	F (8,898)
Manual Work	19.98	23.74	18.24	18.76	22.14	19.98	20.19	18.05	21.70	9.56**
Machine Work	20.22	28.88	21.80	19.03	26.38	30.85	28.39	20.33	28.15	22.48**
Personal Service	25.13	27.19	22.47	25.05	26.66	21.98	20.56	22.13	25.92	9.00**
Care of People-Animals	38.02	31.88	27.99	33.97	32.11	25.92	26.39	30.03	25.38	17.71**
Clerical Work	28.11	31.03	25.55	33.09	29.94	23.33	23.31	27.41	26.12	12.97**
Inspecting & Testing	22.80	29.91	22.02	22.51	28.24	25.42	24.18	20.76	26.87	19.11**
Crafts	22.64	29.18	24.85	21.15	28.72	35.92	30.73	23.24	29.89	22.77**
Customer Service	30.75	32.70	31.38	34.72	33.94	28.46	26.35	31.93	33.15	8.23**
Nursing	42.75	30.38	24.73	32.14	29.45	23.39	24.43	28.35	25.49	30.29**
Skilled Pers. Service	26.19	27.34	23.54	26.79	26.11	21.25	20.41	23.76	23.61	9.30**
Training	32.72	32.25	32.69	32.98	33.78	33.90	35.14	32.91	34.01	1.33
Literary	28.54	26.20	33.73	29.89	27.99	25.97	26.38	29.95	29.24	7.88**
Numerical	23.95	28.15	29.87	28.04	29.59	33.08	32.46	31.70	33.86	7.05**
Appraisal	26.16	29.03	30.57	26.69	31.09	35.63	34.85	28.71	34.95	12.62**
Agriculture	25.52	30.59	28.92	24.81	30.86	35.81	34.19	26.07	32.13	13.19**
Applied Tech.	24.47	28.71	30.80	25.35	30.60	39.26	35.74	28.89	34.70	18.43**
Promotion-Comm.	30.26	28.39	34.00	32.62	32.54	31.71	32.11	33.56	36.52	7.16**
Management	33.75	33.40	35.15	36.06	34.81	37.81	37.89	38.22	42.04	8.98**
Artistic	30.08	29.74	34.60	33.73	31.14	28.60	28.74	30.89	32.32	5.38**
Sales Represent.	26.72	29.52	29.46	28.03	31.69	33.78	30.92	29.49	35.60	7.58**
Music	29.42	27.19	31.26	30.11	28.55	29.81	26.90	29.14	27.13	2.28*
Entertainment	28.11	25.73	28.78	29.77	27.34	25.97	24.29	27.66	28.10	3.43**
Teach.-Couns.-Soc. Wk.	34.20	31.55	36.55	35.56	33.81	33.49	35.17	36.49	34.73	4.13**
Medical	33.80	26.29	25.07	26.36	27.46	27.69	28.02	27.69	26.78	5.27**

**p < .01
*p < .05

Table 31. Mean Need Scores for Second-Order Clusters

Scale	1 N=60	2 N=153	3 N=111	4 N=98	5 N=101	6 N=66	7 N=46	8 N=88	9 N=63	F (8,777)
Ability Utilization	1.66	1.45	1.67	1.56	1.54	1.60	1.41	1.73	1.63	2.19*
Achievement	1.75	1.48	1.66	1.72	1.75	1.76	1.61	1.78	1.76	2.73**
Activity	0.32	0.68	0.15	0.59	0.55	0.03	-0.03	0.41	0.49	8.65**
Advancement	1.43	1.57	1.37	1.79	1.69	1.68	1.53	1.75	1.93	4.26**
Authority	-0.08	0.01	-0.06	-0.12	0.09	0.08	-0.14	-0.06	0.45	2.83**
Comp. Pol. & Pract.	1.25	1.23	1.20	1.36	1.45	1.11	0.99	1.35	1.24	2.17*
Compensation	1.05	1.27	1.03	1.47	1.42	1.26	1.21	1.28	1.11	2.79**
Co-Workers	0.76	0.87	0.73	0.92	1.00	0.73	0.61	0.74	0.50	3.69**
Creativity	1.24	0.94	1.36	1.08	1.15	1.17	1.11	1.31	1.56	6.22**
Independence	-0.32	0.39	0.04	0.41	0.21	-0.15	-0.37	-0.02	-0.25	10.74**
Moral Values	1.23	1.22	1.40	1.17	1.45	1.33	1.38	1.37	1.22	0.80
Recognition	1.00	1.04	0.99	1.33	1.28	1.23	1.02	1.24	1.29	3.29**
Responsibility	1.04	0.86	1.20	1.11	1.09	1.16	1.03	1.21	1.49	5.19**
Security	1.11	1.63	0.95	1.29	1.47	1.23	1.16	1.04	1.18	6.80**
Social Service	1.61	1.19	1.22	1.17	1.41	0.92	0.66	1.14	1.24	5.80**
Social Status	-0.16	0.26	-0.01	0.05	0.22	0.04	-0.08	0.10	0.27	1.94*
Supervision-H.R.	1.13	1.19	1.00	1.19	1.28	0.98	1.16	1.09	1.11	1.68
Supervision-Tech.	0.91	1.06	0.61	0.92	1.06	0.67	0.56	0.74	0.89	5.67**
Variety	0.47	0.49	0.44	0.60	0.68	0.26	0.25	0.56	0.63	2.44*
Working Conditions	1.20	1.41	1.05	1.35	1.33	0.94	0.83	1.02	0.97	6.49**

**p < .01
*p < .05

Table 32. Mean Interest Scores for Job Clusters - Males

Scale	1 N=49	2 N=69	5 N=42	7 N=56	9 N=39	10 N=16	11 N=28	$F_{(6,292)}$
Manual Work	18.57	20.02	21.47	21.82	18.48	22.87	25.57	4.05**
Machine Work	29.08	28.18	31.35	28.44	23.74	33.68	32.07	3.84**
Personal Service	19.81	20.18	22.78	25.94	21.25	25.62	27.64	6.41**
Care of People-Animals	24.14	25.89	26.52	26.41	24.84	32.00	29.71	3.07**
Clerical Work	20.08	21.91	23.04	26.37	21.15	31.25	30.07	9.76**
Inspect. & Test.	22.46	23.27	27.52	27.21	21.58	31.25	31.71	10.36**
Crafts	35.57	32.07	31.40	30.41	27.23	36.56	34.39	4.20**
Customer Service	25.81	26.63	27.71	33.46	30.17	35.31	35.10	10.05**
Nursing	22.14	24.42	23.33	26.01	22.94	26.50	27.60	2.46*
Skilled Pers. Service	19.79	21.28	21.85	23.44	20.74	24.93	25.28	2.74*
Training	32.59	33.97	32.59	35.14	34.02	37.81	33.89	1.40
Literary	25.32	29.20	25.76	30.53	31.05	27.06	26.85	3.14**
Numerical	33.83	35.69	30.85	34.10	32.92	31.12	32.50	1.45
Appraisal	36.24	37.49	29.04	35.60	32.71	33.62	35.67	5.36**
Agriculture	34.85	33.10	31.54	34.26	32.20	37.87	36.03	1.44
Applied Technology	41.32	38.76	32.42	34.96	34.53	33.87	34.57	5.34**
Promotion-Communication	30.63	33.40	30.33	37.01	37.61	34.68	31.75	5.75**
Management	37.93	40.66	35.88	42.73	41.66	37.81	38.03	4.36**
Artistic	28.57	31.15	29.73	32.66	29.97	27.81	29.14	1.65
Sales Representative	34.73	32.36	30.21	34.76	37.46	30.93	36.78	3.98**
Music	29.30	29.47	28.52	27.55	28.66	30.31	28.89	0.26
Entertainment	25.04	26.63	26.38	27.25	27.30	27.18	26.46	0.91
Teach.-Couns.-Soc. Work	32.83	37.81	30.73	35.66	38.28	36.25	32.03	4.51**
Medical	27.97	30.13	24.30	26.71	27.58	26.25	26.85	2.01

**p < .01
*p < .05

Table 33. Mean Need Scores for Job Clusters - Males

Scale	1 N=49	2 N=69	5 N=42	7 N=56	9 N=39	10 N=16	11 N=28	$F_{(6,292)}$
Ability Utilization	1.58	1.44	1.38	1.62	1.85	1.55	1.79	2.59*
Achievement	1.77	1.64	1.49	1.73	2.01	1.61	1.77	2.48*
Activity	-0.02	-0.07	0.43	0.43	0.41	0.10	0.75	5.27**
Advancement	1.72	1.45	1.49	1.79	1.82	1.45	1.99	2.85*
Authority	0.17	-0.12	0.19	0.39	0.52	-0.26	0.41	3.87**
Comp. Pol. & Pract.	1.03	0.96	1.25	1.24	1.09	1.26	1.51	2.16*
Compensation	1.24	1.02	1.25	1.09	1.29	1 30	1.76	2.72**
Co-Workers	0.67	0.66	0.86	0.44	0.63	0.86	1.20	3.63**
Creativity	1.27	1.30	1.13	1.51	1.55	0 81	1.46	4.28**
Independence	-0.16	-0.39	0.23	-0.35	0.06	-0.23	0.29	4.80*
Moral Values	1.33	1.37	1.50	1.19	1.82	1.41	1.09	1.59
Recognition	1.26	1.04	1.13	1.21	1.22	1.08	1.63	2.34*
Responsibility	1.25	1.15	1.11	1.45	1.55	0.80	1.31	3.95**
Security	1.08	0.97	1.30	1.07	0.81	1.56	1.74	3.89**
Social Service	0.71	0.66	1.31	1.18	1.48	1.50	1.48	7.66**
Social Status	-0.13	0.00	0.28	-0.04	0.73	0.56	0.78	5.99**
Supervision-H.R.	0.92	0.94	1.20	1.10	1.10	1.15	1.36	1.75
Supervision-Tech.	0.51	0.37	0.97	0.88	0.82	1.08	1.17	5.84**
Variety	0.23	0.29	0.46	0.55	0.65	0.22	0.80	2.62*
Working Conditions	0.83	0.76	1.16	0.95	0.74	1.22	1.53	5.21**

**p < .01
*p < .05

Table 34. Mean Need Scores for Job Clusters - Females

Scale	3 N=55	4 N=56	5 N=88	6 N=54	8 N=115	11 N=35	F(5,397)
Ability Utilization	1.69	1.80	1.49	1.69	1.62	1.25	4.72**
Achievement	1.75	1.77	1.53	1.62	1.74	1.66	1.74
Activity	0.28	0.65	0.72	0.21	0.57	0.64	5.18**
Advancement	1.39	1.91	1.49	1.20	1.70	1.59	6.20**
Authority	-0.12	-0.28	-0.25	-0.26	-0.09	-0.16	0.67
Comp. Pol. & Prac.	1.29	1.65	1.16	1.51	1.31	1.05	4.36**
Compensation	1.03	1.44	1.23	0.98	1.33	1.39	2.75*
Co-Workers	0.76	0.82	0.82	0.75	0.89	1.05	1.14
Creativity	1.20	1.10	0.81	1.28	1.15	0.67	6.15**
Independence	-0.34	0.20	0.37	0.04	0.38	0.01	8.39**
Moral Values	1.27	1.30	1.31	1.55	1.22	1.07	1.22
Recognition	0.98	1.32	0.97	0.87	1.25	1.25	4.32**
Responsibility	1.01	1.01	0.64	1.11	1.15	0.72	6.52**
Security	1.08	1.40	1.62	0.90	1.22	1.54	6.99**
Social Service	1.70	1.33	1.07	1.37	1.24	1.27	4.35**
Social Status	-0.20	-0.11	0.10	-0.15	0.02	0.18	1.49
Supervision-H. R.	1.16	1.32	1.12	1.06	1.14	1.04	1.07
Supervision-Tech.	0.94	1.01	0.99	0.76	0.88	0.98	1.06
Variety	0.41	0.63	0.32	0.40	0.60	0.64	2.12
Working Conditions	1.23	1.30	1.42	1.24	1.29	1.23	0.74

**p < .01
*p < .05

Table 35. Mean Interest Scores for Job Clusters - Females

Scale	3 N=55	4 N=56	5 N=88	6 N=54	8 N=115	11 N=35	$F_{(5,397)}$
Manual Work	18.96	18.23	23.30	17.94	18.71	22.05	7.54**
Machine Work	18.72	18.76	24.22	18.31	18.74	21.85	6.60**
Personal Service	24.63	23.87	29.17	23.92	24.85	29.60	5.41**
Care of People-Animals	40.20	33.00	35.32	32.22	32.84	34.60	6.59**
Clerical Work	27.43	32.25	36.71	27.53	31.88	34.91	10.13**
Inspect. & Test.	21.78	21.69	30.25	21.40	22.17	28.40	15.68**
Crafts	21.16	20.98	24.94	21.35	21.02	23.28	3.58**
Customer Service	30.21	34.67	36.87	34.14	34.67	36.17	4.03**
Nursing	44.41	31.25	35.30	27.09	30.89	32.82	21.27**
Skilled Pers. Service	26.25	25.23	30.53	26.44	26.12	27.34	4.00**
Training	32.58	31.85	31.52	32.85	31.91	30.25	0.57
Literary	28.69	29.21	27.72	33.92	31.21	27.37	3.71**
Numerical	22.50	32.46	28.03	26.83	26.46	26.60	5.44**
Appraisal	25.23	27.46	27.30	27.57	26.05	25.94	0.78
Agriculture	26.03	22.85	27.28	25.77	24.34	25.17	2.05
Applied Technology	23.60	26.21	24.70	27.27	24.74	23.37	1.38
Promotion-Communication	30.18	31.25	28.50	34.31	32.46	28.51	3.51**
Management	33.27	35.55	33.01	32.98	35.53	30.74	2.86*
Artistic	30.78	32.28	30.80	36.40	34.21	30.71	3.38**
Sales Representative	25.70	27.85	28.98	27.38	27.36	28.48	1.15
Music	29.45	28.57	26.60	33.01	30.03	26.45	2.88*
Entertainment	28.47	27.87	25.47	29.94	29.29	27.22	2.13
Teach.-Couns.-Soc. Work	33.94	34.35	33.84	38.74	35.15	31.20	3.51**
Medical	35.40	26.91	27.32	29.94	25.73	24.94	9.41**

**p < .01
*p < .05

Table 36. Mean Interest Scores for Attribute Clusters - Males

Scale	1 N=45	5 N=68	7 N=44	8 N=28	10 N=35	$F_{(4,215)}$
Manual Work	20.86	20.67	22.90	25.57	18.62	4.33**
Machine Work	29.11	26.47	32.38	32.07	26.14	5.30**
Personal Service	20.08	24.41	25.50	27.64	21.11	6.10**
Care of People-Animals	26.57	25.50	31.59	29.71	25.14	5.80**
Clerical Work	23.00	24.97	27.97	30.07	20.31	7.78**
Inspecting & Testing	24.64	25.42	29.40	31.71	21.22	11.42**
Crafts	32.82	29.02	35.15	34.39	30.00	4.75**
Customer Service	26.95	32.77	32.68	35.10	26.42	8.71**
Nursing	23.51	25.16	28.29	27.60	25.37	2.53*
Skilled Pers. Service	21.28	22.11	25.59	25.28	22.05	3.28*
Training	33.11	34.76	37.20	33.89	35.22	2.09
Literary	27.48	29.89	29.88	26.85	32.25	2.36*
Numerical	35.46	34.58	30.72	32.50	37.08	3.17*
Appraisal	38.48	34.82	34.40	35.67	34.94	2.30
Agriculture	35.55	33.36	36.61	36.03	29.48	3.85**
Applied Tech.	39.11	34.58	34.88	34.57	38.20	2.92*
Promotion-Comm.	31.42	37.33	33.86	31.75	36.54	5.73**
Management	40.33	43.30	37.72	38.03	39.97	4.98**
Artistic	31.60	30.95	30.65	29.14	31.71	0.50
Sales Represent.	33.22	35.85	31.15	36.78	30.45	4.85**
Music	27.08	27.20	30.90	28.89	34.00	3.86**
Entertainment	24.91	27.02	27.50	26.46	30.48	2.12
Teach.-Couns.-Soc. Wk.	36.06	36.55	34.93	32.03	39.48	3.20*
Medical	28.86	26.67	27.88	26.85	31.00	1.63

**$p < .01$
*$p < .05$

Table 37. Mean Need Scores for Attribute Clusters - Males

Scale	1 N=45	5 N=68	7 N=44	8 N=28	10 N=35	$F_{(4,215)}$
Ability Utilization	1.41	1.69	1.37	1.79	1.44	3.52**
Achievement	1.61	1.78	1.40	1.77	1.61	3.08*
Activity	-0.03	0.41	0.25	0.75	-0.19	6.49**
Advancement	1.56	1.89	1.42	1.99	1.21	7.59**
Authority	-0.16	0.47	-0.03	0.41	-0.04	5.89**
Comp. Pol. & Practices	1.07	1.21	1.24	1.51	0.82	3.64**
Compensation	1.24	1.24	1.19	1.76	0.64	7.65**
Co-Workers	0.63	0.47	0.83	1.20	0.74	5.37**
Creativity	1.08	1.49	0.99	1.46	1.58	8.13**
Independence	-0.38	-0.32	0.00	0.29	-0.40	5.38**
Moral Values	1.37	1.37	1.11	1.09	1.43	0.75
Recognition	1.06	1.24	0.95	1.63	0.98	5.35**
Responsibility	1.01	1.47	0.96	1.31	1.34	6.40**
Security	1.18	1.01	1.43	1.74	0.57	7.32**
Social Service	0.67	1.22	1.35	1.48	0.74	7.52**
Social Status	-0.03	0.19	0.16	0.78	-0.02	3.72**
Supervision-H.R.	1.20	1.12	1.13	1.36	0.52	7.53**
Supervision-Tech.	0.59	0.88	1.01	1.17	0.09	10.89**
Variety	0.26	0.58	0.42	0.80	0.21	3.24*
Working Conditions	0.88	0.91	1.16	1.53	0.53	9.57**

**p < .01
*p < .05

Table 38. Mean Need Scores for Attribute Clusters - Females

Scale	2 N=55	3 N=69	4 N=88	6 N=79	8 N=52	9 N=60	F(5,397)
Ability Utilization	1.69	1.68	1.49	1.64	1.39	1.73	2.90*
Achievement	1.75	1.73	1.53	1.79	1.62	1.67	1.84
Activity	0.28	0.63	0.72	0.67	0.56	0.17	6.57**
Advancement	1.39	1.88	1.49	1.83	1.38	1.28	7.24**
Authority	-0.12	-0.32	-0.25	0.05	-0.20	-0.30	2.04
Comp. Pol. & Prac.	1.29	1.57	1.16	1.36	1.34	1.27	2.30*
Compensation	1.03	1.49	1.23	1.47	1.17	0.93	4.78**
Co-Workers	0.76	0.81	0.82	1.01	0.93	0.71	1.86
Creativity	1.20	0.96	0.81	1.24	0.86	1.30	5.90**
Independence	-0.34	0.21	0.37	0.55	0.04	-0.02	11.32**
Moral Values	1.27	1.28	1.31	1.11	1.48	1.36	0.96
Recognition	0.98	1.30	0.97	1.42	0.98	0.92	6.25**
Responsibility	1.01	0.97	0.64	1.22	0.85	1.11	6.53**
Security	1.08	1.43	1.62	1.30	1.24	0.91	6.54**
Social Service	1.70	1.31	1.07	1.20	1.48	1.22	5.10**
Social Status	-0.20	0.02	0.10	0.08	-0.11	-0.14	1.31**
Supervision-H. R.	1.16	1.30	1.12	1.18	1.09	0.98	1.54
Supervision-Tech.	0.94	1.02	0.99	0.96	1.00	0.57	3.87**
Variety	0.41	0.58	0.32	0.73	0.51	0.39	2.88*
Working Conditions	1.23	1.37	1.42	1.37	1.15	1.15	1.89

**p < .01
*p < .05

Table 39. Mean Interest Scores for Attribute Clusters - Females

Scale	1 N=55	2 N=69	3 N=88	4 N=79	5 N=52	6 N=60	$F_{(5,397)}$
Manual Work	18.96	18.79	23.30	19.10	20.53	17.33	6.90**
Machine Work	18.72	19.00	24.22	19.29	21.65	16.66	7.85**
Personal Service	24.63	24.68	29.17	25.77	27.00	23.00	4.38**
Care of People-Animals	40.20	33.86	35.32	34.13	35.09	28.61	10.70**
Clerical Work	27.43	33.28	36.71	34.40	29.73	27.01	12.62**
Inspecting & Testing	21.78	22.43	30.25	22.92	26.05	20.01	14.69**
Crafts	21.16	20.91	24.94	21.32	23.32	20.33	4.04**
Customer Service	30.21	35.60	36.87	35.39	35.05	32.73	4.67**
Nursing	44.41	32.68	35.30	31.96	31.55	24.90	25.63**
Skilled Pers. Service	26.25	26.24	30.53	27.54	26.50	23.95	5.05**
Training	32.58	32.24	31.52	33.18	31.44	30.08	1.24
Literary	28.69	28.97	27.72	29.63	29.09	36.05	6.00**
Numerical	22.50	30.17	28.03	27.41	26.01	27.35	3.59**
Appraisal	25.23	26.46	27.30	26.35	26.26	27.61	0.59
Agriculture	26.03	23.05	27.28	24.46	26.17	24.46	2.13
Applied Tech.	23.60	25.26	24.70	24.78	25.38	26.40	0.59
Promotion-Comm.	30.18	32.11	28.50	31.33	31.32	32.90	1.99
Management	33.27	35.68	33.01	35.39	32.09	32.80	2.61*
Artistic	30.78	32.91	30.80	33.82	32.25	36.06	2.62*
Sales Represent.	25.70	27.63	28.98	28.58	28.25	25.81	1.88
Music	29.45	28.52	26.60	30.30	27.80	32.58	2.48*
Entertainment	28.47	28.49	25.47	30.18	27.07	29.01	2.31*
Teach.-Couns.-Soc. Wk.	33.94	34.94	33.84	35.49	33.96	36.16	0.72
Medical	35.40	26.88	27.32	26.34	26.73	22.66	10.88**

**$p < .01$
*$p < .05$

Table 40. Standard Deviations of Interest Scores for Second-Order Clusters

Scale	1 N=68	2 N=189	3 N=114	4 N=100	5 N=111	6 N=71	7 N=94	8 N=95	9 N=65
Manual Work	6.68	8.47	6.50	6.54	7.01	6.47	5.86	5.59	9.16
Machine Work	8.63	11.26	9.33	7.46	9.49	9.21	8.52	6.84	10.07
Personal Service	8.21	9.78	8.45	7.97	8.41	6.40	5.59	8.25	8.98
Care of People-Animals	9.59	10.28	9.45	8.31	8.14	8.01	7.51	8.14	8.67
Clerical Work	10.18	10.81	9.74	8.36	9.30	8.06	6.57	10.06	9.83
Inspecting & Testing	7.79	8.77	7.87	7.52	8.43	7.96	6.43	7.07	8.49
Crafts	8.26	10.84	9.24	7.54	9.50	6.80	9.06	7.48	10.43
Customer Service	9.24	10.10	9.48	8.32	8.71	7.53	7.38	9.04	9.15
Nursing	8.36	11.23	9.04	10.00	8.74	7.33	7.50	9.28	9.59
Skilled Pers. Service	8.31	9.45	7.80	7.94	8.65	6.75	5.80	7.74	9.46
Training	7.48	8.83	8.71	7.48	7.49	6.87	8.11	7.64	8.77
Literary	10.22	10.01	9.99	9.77	8.61	7.27	8.38	8.91	8.98
Numerical	8.78	10.70	11.64	10.38	9.52	9.36	10.43	9.80	10.78
Appraisal	8.12	10.06	9.48	8.85	8.83	8.66	8.97	9.01	8.36
Agriculture	7.96	10.51	10.60	9.05	9.60	8.92	9.70	9.89	10.11
Applied Tech.	9.30	11.12	10.92	8.89	9.80	9.13	9.24	10.24	11.02
Promotion-Comm.	9.17	10.47	9.13	9.06	8.78	6.73	8.69	8.91	8.46
Management	7.58	9.46	9.23	8.13	8.43	7.54	7.97	7.95	9.10
Artistic	10.46	9.19	10.25	9.70	8.47	7.88	7.99	9.03	8.19
Sales Represent.	8.81	9.24	9.55	7.90	7.81	7.79	8.00	8.77	9.63
Music	10.75	10.57	11.49	11.05	8.85	10.10	9.95	9.96	10.63
Entertainment	10.39	9.53	9.89	9.87	8.41	8.36	8.24	8.88	10.05
Teach.-Couns.-Soc. Wk.	9.55	10.17	8.95	8.37	9.40	7.95	8.46	8.65	9.59
Medical	8.02	10.13	9.29	9.82	8.58	9.02	9.80	9.57	10.37

Table 41. Standard Deviations of Need Scores for Second-Order Clusters

Scale	1 N=62	2 N=154	3 N=113	4 N=100	5 N=101	6 N=67	7 N=47	8 N=90	9 N=63
Ability Utilization	0.53	0.66	0.65	0.61	0.67	0.65	0.60	0.68	0.65
Achievement	0.55	0.64	0.68	0.82	0.64	0.68	0.65	0.63	0.59
Activity	0.70	0.75	0.73	0.77	0.75	0.77	0.86	0.92	0.87
Advancement	0.63	0.75	0.74	0.78	0.86	0.77	0.69	0.87	0.72
Authority	0.70	0.93	0.92	0.90	0.90	0.93	0.74	0.91	0.87
Comp. Pol. & Pract.	0.74	0.84	0.73	0.77	0.76	0.78	0.80	0.75	0.85
Compensation	0.79	0.83	0.80	0.91	0.95	0.83	0.78	0.97	0.77
Co-Workers	0.63	0.68	0.75	0.71	0.72	0.56	0.85	0.76	0.69
Creativity	0.60	0.69	0.64	0.72	0.79	0.68	0.62	0.74	0.64
Independence	0.62	0.82	0.87	0.83	0.79	0.91	0.80	0.88	0.80
Moral Values	0.93	0.99	1.11	0.99	1.13	1.27	1.25	1.11	1.16
Recognition	0.65	0.68	0.64	0.77	0.86	0.73	0.82	0.73	0.69
Responsibility	0.63	0.78	0.63	0.74	0.80	0.72	0.58	0.69	0.59
Security	0.74	0.71	0.90	0.94	0.92	0.95	0.85	1.02	0.87
Social Service	0.83	0.75	1.00	0.76	0.84	0.95	0.83	0.80	0.86
Social Status	0.76	0.89	1.11	1.06	1.05	1.01	0.94	0.89	1.07
Supervision-H.R.	0.55	0.75	0.65	0.81	0.67	0.64	0.65	0.80	0.77
Supervision-Tech.	0.58	0.73	0.68	0.76	0.65	0.82	0.72	0.93	0.75
Variety	0.79	0.79	0.79	0.82	0.80	0.84	0.83	0.83	0.77
Working Conditions	0.65	0.70	0.83	0.73	0.69	0.76	0.84	0.79	0.70

Table 42. Standard Deviations of Need Scores for Job Clusters - Males

Scale	1 N=49	2 N=69	5 N=42	7 N=56	9 N=39	10 N=16	11 N=28
Ability Utilization	0.61	0.63	0.64	0.66	0.86	0.49	0.59
Achievement	0.66	0.61	0.64	0.60	0.81	0.52	0.59
Activity	0.73	0.91	0.78	0.82	0.88	0.79	0.88
Advancement	0.81	0.73	0.77	0.80	0.71	0.48	0.80
Authority	0.98	0.78	0.90	0.85	1.05	0.68	0.77
Comp. Pol. & Practices	0.78	0.75	0.77	0.82	0.79	0.77	0.69
Compensation	0.84	0.86	0.97	0.72	0.92	0.69	0.85
Co-Workers	0.58	0.84	0.82	0.67	0.87	0.50	0.59
Creativity	0.66	0.65	0.56	0.64	0.68	0.53	0.61
Independence	0.97	0.77	0.84	0.65	0.98	0.67	0.80
Moral Values	1.38	1.19	1.16	1.19	1.12	0.95	0.81
Recognition	0.78	0.73	0.65	0.69	0.86	0.50	0.75
Responsibility	0.73	0.65	0.64	0.62	0.68	0.47	0.61
Security	0.93	0.88	0.84	0.90	1.11	0.87	0.98
Social Service	0.90	0.87	0.85	0.84	0.90	0.75	0.83
Social Status	1.03	1.00	0.97	1.09	0.94	0.71	0.69
Supervision-H.R.	0.64	0.71	0.67	0.72	0.97	0.62	0.65
Supervision-Tech.	0.84	0.84	0.77	0.68	0.90	0.56	0.81
Variety	0.87	0.91	0.68	0.72	0.89	0.58	0.82
Working Conditions	0.79	0.82	0.82	0.60	0.79	0.54	0.58

Table 43. Standard Deviations of Interest Scores for Job Clusters - Males

Scale	1 N=49	2 N=69	5 N=42	7 N=56	9 N=39	10 N=16	11 N=28
Manual Work	5.05	6.64	9.69	8.71	5.66	7.32	6.32
Machine Work	9.18	8.10	13.33	9.82	7.19	7.70	6.63
Personal Service	5.02	7.05	10.97	8.60	8.41	5.46	6.05
Care of People-Animals	7.13	6.67	9.86	9.21	8.08	7.96	6.12
Clerical Work	5.68	8.01	8.76	9.39	7.90	6.98	5.51
Inspecting & Testing	6.59	6.77	9.37	7.37	7.12	5.92	7.01
Crafts	6.21	8.32	13.80	10.55	7.85	8.50	6.35
Customer Service	6.24	8.01	8.56	8.90	8.64	6.57	5.17
Nursing	5.99	6.77	9.16	9.24	7.79	9.02	5.90
Skilled Pers. Service	5.63	6.83	9.96	8.25	6.80	7.20	5.44
Training	6.89	6.87	9.78	7.77	8.54	5.13	5.93
Literary	7.14	8.16	11.02	10.01	8.17	7.82	6.01
Numerical	9.21	8.30	11.13	10.40	10.16	9.65	6.82
Appraisal	9.12	7.18	11.28	8.17	7.21	7.27	6.48
Agriculture	7.83	9.65	12.39	10.12	9.55	11.75	5.75
Applied Technology	9.04	7.75	11.58	11.15	7.32	7.29	6.64
Promotion-Communication	5.95	8.40	11.28	8.54	7.36	7.04	5.39
Management	7.70	6.05	10.28	9.39	7.51	7.32	5.13
Artistic	8.28	8.01	9.23	8.36	7.21	7.00	7.89
Sales Representative	6.55	7.43	10.65	9.92	8.06	10.53	4.51
Music	9.73	10.51	12.58	10.28	10.75	11.69	6.85
Entertainment	7.98	8.43	11.63	9.76	9.34	9.80	7.19
Teach.-Couns.-Soc. Work	7.60	7.73	11.65	10.10	8.88	9.28	8.74
Medical	8.54	8.88	10.70	9.65	7.35	11.03	7.07

Table 44. Standard Deviations of Need Scores for Job Clusters - Females

Scale	3 N=55	4 N=56	5 N=88	6 N=54	8 N=115	11 N=35
Ability Utilization	0.50	0.64	0.65	0.56	0.55	0.60
Achievement	0.56	0.61	0.64	0.58	0.59	0.56
Activity	0.69	0.75	0.70	0.64	0.77	0.56
Advancement	0.60	0.88	0.77	0.77	0.77	0.73
Authority	0.66	0.77	0.87	0.89	0.86	0.99
Comp. Pol. & Practices	0.69	0.64	0.91	0.74	0.77	0.60
Compensation	0.78	0.83	0.80	0.92	0.88	0.81
Co-Workers	0.59	0.70	0.60	0.73	0.69	0.76
Creativity	0.59	0.75	0.71	0.55	0.72	0.87
Independence	0.61	0.88	0.73	0.73	0.82	0.83
Moral Values	0.91	1.03	0.95	1.10	0.97	1.02
Recognition	0.65	0.71	0.70	0.72	0.75	0.76
Responsibility	0.60	0.63	0.77	0.59	0.71	0.95
Security	0.73	0.77	0.74	0.80	0.94	0.72
Social Service	0.73	0.76	0.73	0.97	0.80	0.73
Social Status	0.72	0.78	0.85	1.12	1.00	0.95
Supervision-H.R.	0.54	0.60	0.82	0.63	0.74	0.63
Supervision-Tech.	0.55	0.66	0.75	0.75	0.74	0.51
Variety	0.76	0.76	0.76	0.73	0.83	0.71
Working Conditions	0.64	0.67	0.73	0.80	0.73	0.63

Table 45. Standard Deviations of Interest Scores for Job Clusters - Females

Scale	3 N=55	4 N=56	5 N=88	6 N=54	8 N=115	11 N=35
Manual Work	6.05	5.76	7.36	7.59	7.14	5.85
Machine Work	7.13	5.79	9.68	8.36	8.29	7.88
Personal Service	7.85	8.24	9.43	9.16	8.54	9.29
Care of People-Animals	7.29	7.10	9.13	11.08	8.87	8.50
Clerical Work	10.21	8.32	9.04	11.02	9.02	9.23
Inspecting & Testing	7.48	7.37	8.91	9.32	7.80	8.78
Crafts	7.07	6.37	7.71	8.70	7.85	7.55
Customer Service	9.35	7.47	8.86	10.14	8.42	10.16
Nursing	6.32	9.35	9.69	10.47	10.63	11.06
Skilled Pers. Service	8.03	7.88	7.45	9.08	8.27	10.90
Training	7.97	7.09	7.87	8.52	7.65	9.03
Literary	9.86	9.50	9.55	11.23	9.96	9.27
Numerical	7.86	10.76	10.78	11.28	10.22	10.52
Appraisal	7.70	8.87	9.04	9.22	8.25	8.35
Agriculture	8.32	9.18	8.54	10.46	8.90	8.39
Applied Technology	7.97	9.30	9.45	10.51	8.93	7.96
Promotion-Communication	9.43	8.49	9.92	10.85	9.19	10.84
Management	7.48	7.04	8.41	9.50	7.81	8.95
Artistic	10.35	10.03	9.09	10.98	10.03	9.37
Sales Representative	8.45	8.62	8.45	8.43	8.11	8.44
Music	11.30	10.59	10.67	11.61	11.20	10.45
Entertainment	10.15	9.56	8.36	10.60	9.87	9.78
Teach.-Couns.-Soc. Work	9.98	7.88	9.19	9.78	8.31	9.95
Medical	7.59	9.76	9.21	11.05	10.24	9.15

Table 46. Standard Deviations of Need Scores for Attribute Clusters - Males

Scale	1 N=45	5 N=68	7 N=44	8 N=28	10 N=35
Ability Utilization	0.60	0.67	0.60	0.59	0.60
Achievement	0.65	0.63	0.57	0.59	0.52
Activity	0.86	0.83	0.86	0.87	0.87
Advancement	0.70	0.76	0.61	0.80	0.71
Authority	0.74	0.92	0.78	0.77	0.85
Comp. Pol. and Practices	0.77	0.75	0.82	0.69	0.68
Compensation	0.78	0.84	0.66	0.85	0.79
Co-Workers	0.85	0.69	0.66	0.59	0.74
Creativity	0.63	0.65	0.59	0.61	0.51
Independence	0.80	0.70	0.83	0.80	0.72
Moral Values	1.21	1.19	1.10	0.81	1.21
Recognition	0.81	0.70	0.62	0.75	0.55
Responsibility	0.58	0.64	0.55	0.61	0.64
Security	0.85	1.02	0.98	0.98	0.74
Social Service	0.80	0.74	0.82	0.83	0.95
Social Status	0.91	1.04	0.92	0.69	1.03
Supervision-H.R.	0.66	0.80	0.64	0.65	0.51
Supervision-Tech.	0.74	0.77	0.68	0.81	0.82
Variety	0.86	0.73	0.74	0.82	0.90
Working Conditions	0.87	0.62	0.66	0.58	0.61

Table 47. Standard Deviations of Interest Scores for Attribute Clusters - Males

Scale	1 N=45	5 N=68	7 N=44	8 N=28	10 N=35
Manual Work	6.24	8.30	7.13	6.32	6.97
Machine Work	8.29	9.78	7.58	6.63	7.47
Personal Service	6.01	8.90	7.17	6.05	8.65
Care of People-Animals	6.90	9.05	8.09	6.12	6.39
Clerical Work	7.41	9.03	8.59	5.51	8.25
Inspecting and Testing	6.35	7.91	6.84	7.01	6.64
Crafts	8.97	10.07	7.50	6.35	6.80
Customer Service	7.36	8.86	8.61	5.17	8.59
Nursing	6.30	9.15	8.95	5.90	7.02
Skilled Personal Service	6.46	8.01	7.05	5.44	7.08
Training	7.25	8.07	6.24	5.93	6.08
Literary	8.17	8.74	9.76	6.01	7.50
Numerical	9.10	10.09	8.91	6.82	6.84
Appraisal	7.19	7.94	7.29	6.48	6.82
Agriculture	9.25	9.74	9.97	5.75	8.25
Applied Technology	7.96	10.42	7.99	6.64	6.74
Promotion-Communication	8.71	8.51	7.56	5.39	6.04
Management	5.79	8.86	6.90	5.13	7.46
Artistic	8.51	7.60	9.10	7.89	7.63
Sales Representative	6.80	9.52	8.28	4.51	8.03
Music	11.12	9.91	9.73	6.85	8.21
Entertainment	8.61	9.11	9.22	7.19	8.08
Teach.-Couns.-Social Work	8.03	9.70	8.82	8.74	5.98
Medical	9.31	9.12	9.49	7.07	7.63

Table 48. Standard Deviations of Need Scores for Attribute Clusters - Females

Scale	2 N=55	3 N=69	4 N=88	6 N=79	8 N=52	9 N=60
Ability Utilization	0.50	0.65	0.65	0.57	0.65	0.49
Achievement	0.56	0.62	0.64	0.60	0.59	0.54
Activity	0.69	0.80	0.70	0.72	0.61	0.65
Advancement	0.60	0.77	0.77	0.80	0.79	0.76
Authority	0.66	0.78	0.87	0.91	0.87	0.84
Comp. Pol. & Practices	0.69	0.67	0.91	0.81	0.80	0.64
Compensation	0.78	0.80	0.80	0.95	0.95	0.66
Co-Workers	0.59	0.73	0.60	0.67	0.71	0.72
Creativity	0.59	0.73	0.71	0.72	0.81	0.61
Independence	0.61	0.76	0.73	0.89	0.76	0.78
Moral Values	0.91	1.00	0.95	0.98	1.10	1.04
Recognition	0.65	0.74	0.70	0.78	0.79	0.56
Responsibility	0.60	0.61	0.77	0.76	0.88	0.56
Security	0.73	0.77	0.74	0.91	0.88	0.82
Social Service	0.73	0.75	0.73	0.71	0.84	0.98
Social Status	0.72	0.81	0.85	1.04	0.93	1.11
Supervision-H.R.	0.54	0.65	0.82	0.80	0.62	0.55
Supervision-Tech.	0.55	0.66	0.75	0.79	0.59	0.62
Variety	0.76	0.78	0.76	0.83	0.71	0.74
Working Conditions	0.64	0.65	0.73	0.74	0.63	0.80

Table 49. Standard Deviations of Interest Scores for Attribute Clusters - Females

Scale	2 N=55	3 N=69	4 N=88	6 N=79	8 N=52	9 N=60
Manual Work	6.05	5.86	7.36	7.61	6.94	6.74
Machine Work	7.13	6.46	9.68	8.61	8.67	6.68
Personal Service	7.85	8.10	9.43	8.66	9.55	9.04
Care of People-Animals	7.29	6.93	9.13	7.79	8.91	11.06
Clerical Work	10.21	7.46	9.04	8.41	10.23	10.74
Inspecting & Testing	7.48	7.46	8.91	8.23	9.70	7.77
Crafts	7.07	6.85	7.71	8.15	8.28	7.36
Customer Service	9.35	7.26	8.86	8.19	9.19	10.70
Nursing	6.32	9.82	9.69	9.52	10.37	10.84
Skilled Pers. Service	8.03	7.49	7.45	8.88	9.63	8.78
Training	7.97	6.70	7.87	7.61	8.03	9.19
Literary	9.86	10.09	9.55	9.37	9.60	10.38
Numerical	7.86	10.45	10.78	10.38	9.74	12.40
Appraisal	7.70	8.47	9.04	8.72	7.72	9.39
Agriculture	8.32	9.38	8.54	8.93	9.20	9.47
Applied Technology	7.97	8.99	9.45	8.47	8.87	10.95
Promotion-Communication	9.43	9.04	9.92	9.21	10.56	10.62
Management	7.48	7.08	8.41	8.21	8.16	9.40
Artistic	10.35	9.86	9.09	9.99	9.43	11.49
Sales Representative	8.45	8.25	8.45	7.94	7.85	9.04
Music	11.30	10.57	10.67	11.31	10.25	12.09
Entertainment	10.15	10.23	8.36	10.03	8.98	10.24
Teach.-Couns.-Soc. Work	9.98	8.25	9.19	8.37	9.87	9.90
Medical	7.59	10.62	9.21	9.65	9.70	10.20

APPENDIX H

OCCUPATIONAL CLUSTERS FOR THE STRONG (SVIB) SAMPLE

Table 50. Clusters Based on Job Factors - SVIB Sample

Cluster 1	Cluster 2	Cluster 3
Engineer	Accountant	Sales Manager
Chemist	Mathematician	Production Manager
Biologist	Programmer	Farmer
Physicist	General Office Clerk	Real Estate Salesman
Pharmacist	Musician	Banker
	Credit Manager	Life Insurance Salesman
	Librarian	
	Purchasing Agent	
	Personnel Director	
	Printer	
Cluster 4	**Cluster 5**	**Cluster 6**
Psychologist	Chamber of Commerce Executive	Physical Therapist
Business Education Teacher	Community Recreation Admin.	Psychiatrist
Social Worker	YMCA Secretary	Rehabilitation Counselor
Minister	Credit Manager	
Music Teacher		
Cluster 7	**Cluster 8**	**Cluster 9**
Forest Service Man	Physician	Artist
Policeman	Veterinarian	Architect
	Osteopath	Advertising Man
Cluster 10		
School Superintendent		
President, Manufacturing Concern		
Lawyer		

Table 51. Clusters Based on Attribute Factors - SVIB Sample

Cluster 1	Cluster 2	Cluster 3
Chemist	Physical Therapist	School Superintendent
Pharmacist	Osteopath	Psychologist
Production Manager	Psychiatrist	Business Ed. Teacher
Architect	Rehabilitation Counselor	Social Worker
		Lawyer
Cluster 4	**Cluster 5**	**Cluster 6**
Mathematician	General Office Clerk	Policeman
Programmer	Real Estate Salesman	Artist
Biologist	Librarian	Musician
Physicist	Life Insurance Salesman	Music Teacher
	Purchasing Agent	
Cluster 7	**Cluster 8**	**Cluster 9**
Chamber of Commerce Executive	Sales Manager	Physician
Community Recreation Admin.	Credit Manager	Veterinarian
YMCA Secretary	Banker	
President, Manufacturing Concern		
Cluster 10	**Cluster 11**	
Minister	Advertising Man	
Author	Personnel Director	

APPENDIX I

CORRELATIONS AMONG THREE SETS OF OAI ATTRIBUTE-REQUIREMENT ESTIMATES

Table 52. Correlations Between Three Sets of Interest Estimates

Scale	Job Factors with Attribute Factors	Items with Attribute Factors	Items with Job Factors
Manual Work	.92	.95	.92
Machine Work	.94	.97	.95
Personal Service	.92	.96	.95
Care of People or Animals	.95	.95	.96
Clerical Work	.92	.97	.93
Inspecting and Testing	.91	.97	.93
Crafts & Precise Operations	.90	.96	.93
Customer Services	.88	.97	.93
Nursing & Related Tech. Ser.	.93	.94	.90
Skilled Personal Services	.88	.94	.91
Training	.86	.96	.90
Literary	.92	.98	.92
Numerical	.93	.97	.95
Appraisal	.92	.98	.94
Agriculture	.92	.95	.90
Applied Technology	.92	.98	.94
Promotion and Communication	.93	.98	.93
Management and Supervision	.91	.96	.96
Artistic	.96	.97	.85
Sales Representative	.86	.97	.94
Music	.91	.96	.88
Entertainment & Perform. Arts	.90	.98	.88
Teach., Counsel., & Soc. Work	.88	.97	.93
Medical	.95	.96	.93

Table 53. Correlations Between Three Sets of Need Estimates

Scale	Job Factors with Attribute Factors	Items with Attribute Factors	Items with Job Factors
Ability Utilization	.91	.96	.94
Achievement	.90	.96	.93
Activity	.91	.95	.94
Advancement	.92	.91	.88
Authority	.93	.95	.95
Compensation	.62	.65	.72
Co-Workers	.90	.93	.88
Creativity	.88	.95	.89
Independence	.89	.91	.87
Moral Values	.00	.00	.00
Recognition	.81	.94	.80
Responsibility	.92	.95	.90
Security	.05	-.01	.36
Social Service	.92	.94	.96
Social Status	.90	.93	.90
Variety	.92	.97	.93
Working Conditions	.69	.49	.55

APPENDIX J

CORRELATIONS BETWEEN DIRECT AND SYNTHETIC (OAI) ATTRIBUTE-REQUIREMENT ESTIMATES

Table 54. Correlations Between Direct and Synthetic Interest- and Need-Requirement Estimates for 79 Occupations

Interest or Need	N = 79
Manual Work	.773
Machine Work	.743
Personal Service	.804
Care of People or Animals	.836
Clerical Work	.736
Inspecting and Testing	.689
Crafts and Precise Operations	.756
Customer Services	.600
Nursing and Related Technical Services	.734
Skilled Personal Services	.616
Training	.591
Literary	.787
Numerical	.721
Appraisal	.569
Agriculture	.661
Applied Technology	.715
Promotion and Communication	.749
Management and Supervision	.671
Artistic	.448
Sales Representative	.484
Music	.426
Entertainment and Performing Arts	.256
Teaching, Counseling, and Social Work	.556
Medical	.752
Ability Utilization	.733
Achievement	.696
Activity	.342
Advancement	.298
Authority	.723
Compensation	.608
Co-Workers	.305
Creativity	.797
Independence	.832
Moral Values	-
Recognition	.565
Responsibility	.830
Security	.693
Social Service	.880
Social Status	.756
Variety	.643
Working Conditions	.791

Table 55. Inter-Rater Reliability Coefficients of 41 Direct Interest- and Need-Requirement Estimates for 79 Occupations

Interest or Need	Unadjusted Correlation Coefficient for 3 Raters	Unadjusted Intraclass Correlation Coefficient	Adjusted Correlation Coefficient for 3 Raters	Adjusted Intraclass Correlation Coefficient
Manual Work	.851	.655	.876	.703
Machine Work	.845	.644	.863	.678
Personal Service	.625	.357	.666	.400
Care of People or Animals	.898	.746	.902	.755
Clerical Work	.832	.622	.862	.676
Inspecting and Testing	.742	.489	.791	.558
Crafts and Precise Operations	.661	.394	.694	.430
Customer Services	.719	.460	.753	.505
Nursing and Related Technical Services	.970	.916	.971	.917
Skilled Personal Services	.777	.537	.786	.550
Training	.657	.390	.686	.422
Literary	.650	.382	.728	.472
Numerical	.665	.398	.784	.547
Appraisal	.371	.164	.504	.253
Agriculture	.908	.768	.911	.773
Applied Technology	.767	.523	.800	.572
Promotion and Communication	.705	.444	.748	.498
Management and Supervision	.856	.664	.874	.698
Artistic	.743	.491	.761	.514
Sales Representative	.788	.553	.805	.579
Music	.989	.967	.989	.967
Entertainment and Performing Arts	.855	.663	.863	.678
Teaching, Counseling, and Social Work	.917	.786	.916	.783
Medical	.900	.750	.902	.754
Ability Utilization	.611	.344	.681	.415

Table 55. (continued)

Interest or Need	Unadjusted Correlation Coefficient for 3 Raters	Unadjusted Intraclass Correlation Coefficient	Adjusted Correlation Coefficient for 3 Raters	Adjusted Intraclass Correlation Coefficient
Achievement	.605	.338	.632	.364
Activity	.161	.060	.370	.164
Advancement	.170	.064	.301	.125
Authority	.756	.508	.764	.519
Compensation	.764	.519	.767	.523
Co-Workers	.265	.107	.358	.157
Creativity	.684	.420	.734	.479
Independence	.788	.553	.818	.599
Moral Values	.119	.043	.419	.194
Recognition	.413	.190	.487	.240
Responsibility	.634	.366	.707	.446
Security	.533	.276	.536	.278
Social Service	.758	.511	.807	.582
Social Status	.568	.305	.659	.392
Variety	.592	.326	.662	.395
Working Conditions	.807	.582	.828	.616

Table 56. Inter-Rater Reliability Coefficients of 41 Synthetic Interest- and Need-Requirement Estimates for 79 Occupations

Interest or Need	Unadjusted Correlation Coefficient for 3 Raters	Unadjusted Intraclass Correlation Coefficient	Adjusted Correlation Coefficient for 3 Raters	Adjusted Intraclass Correlation Coefficient
Manual Work	.856	.664	.863	.677
Machine Work	.878	.705	.885	.719
Personal Service	.901	.752	.903	.755
Care of People or Animals	.939	.838	.941	.842
Clerical Work	.816	.597	.821	.605
Inspecting and Testing	.759	.512	.778	.539
Crafts and Precise Operations	.853	.660	.862	.676
Customer Services	.879	.708	.880	.710
Nursing and Related Technical Services	.916	.784	.919	.790
Skilled Personal Services	.805	.579	.809	.586
Training	.907	.764	.908	.767
Literary	.903	.757	.906	.762
Numerical	.897	.744	.899	.747
Appraisal	.803	.576	.808	.585
Agriculture	.895	.740	.897	.745
Applied Technology	.852	.658	.857	.666
Promotion and Communication	.909	.769	.910	.770
Management and Supervision	.909	.769	.909	.768
Artistic	.804	.578	.810	.587
Sales Representative	.845	.645	.847	.648
Music	.906	.763	.907	.766
Entertainment and Performing Arts	.840	.636	.841	.638
Teaching, Counseling, and Social Work	.917	.787	.919	.791
Medical	.903	.756	.906	.762
Ability Utilization	.767	.523	.773	.531
Achievement	.805	.579	.810	.587

Table 56. (continued)

Interest or Need	Unadjusted Correlation Coefficient for 3 Raters	Unadjusted Intraclass Correlation Coefficient	Adjusted Correlation Coefficient for 3 Raters	Adjusted Intraclass Correlation Coefficient
Activity	.736	.482	.753	.503
Advancement	.894	.738	.895	.739
Authority	.930	.816	.929	.815
Compensation	.896	.742	.895	.740
Co-Workers	.859	.669	.860	.673
Creativity	.889	.728	.892	.734
Independence	.922	.797	.922	.798
Moral Values	--	--	--	--
Recognition	.877	.704	.876	.702
Responsibility	.895	.739	.894	.737
Security	.638	.370	.644	.376
Social Service	.939	.836	.940	.839
Social Status	.917	.787	.916	.785
Variety	.848	.650	.851	.655
Working Conditions	.757	.510	.760	.513

Table 57. Frequency Distribution of Unadjusted Inter-Rater Reliability Coefficients of 41 Direct Interest- and Need-Requirement Estimates for 79 Occupations

Reliability Coefficient	Unadjusted r for 3 Raters		Unadjusted Intraclass r	
	Frequency	Cumulative Proportion	Frequency	Cumulative Proportion
.95 - 1.00	2	.992	1	.992
.90 - .94	4	.944	1	.968
.85 - .89	3	.847	0	.944
.80 - .84	3	.774	0	.944
.75 - .79	7	.701	4	.944
.70 - .74	4	.531	0	.847
.65 - .69	5	.434	3	.847
.60 - .64	4	.313	2	.774
.55 - .59	2	.216	3	.726
.50 - .54	1	.168	5	.653
.45 - .49	0	.144	3	.532
.40 - .44	1	.144	3	.459
.35 - .39	1	.120	5	.386
.30 - .34	0	.096	4	.265
.25 - .29	1	.096	1	.168
.20 - .24	0	.072	0	.144
.15 - .19	2	.072	2	.144
.10 - .14	1	.024	1	.096
.05 - .09	0	.000	2	.072
.00 - .04	0	.000	1	.024
	41		41	

Table 58. Frequency Distribution of Adjusted Inter-Rater Reliability Coefficients of 41 Direct Interest- and Need-Requirement Estimates for 79 Occupations

Reliability Coefficient	Adjusted r for 3 Raters		Adjusted Intraclass r	
	Frequency	Cumulative Proportion	Frequency	Cumulative Proportion
.95 - 1.00	2	.983	1	.992
.90 - .94	4	.935	1	.968
.85 - .89	5	.838	0	.944
.80 - .84	5	.727	0	.944
.75 - .79	8	.606	4	.944
.70 - .74	3	.411	2	.847
.65 - .69	6	.338	3	.799
.60 - .64	1	.192	2	.726
.55 - .59	0	.168	6	.678
.50 - .54	2	.168	5	.532
.45 - .49	1	.120	3	.411
.40 - .44	1	.096	5	.338
.35 - .39	2	.078	2	.217
.30 - .34	1	.024	0	.169
.25 - .29	0	.000	2	.169
.20 - .24	0	.000	1	.121
.15 - .19	0	.000	3	.097
.10 - .14	0	.000	1	.024
.05 - .09	0	.000	0	.000
.00 - .04	0	.000	0	.000
	41		41	

Table 59. Frequency Distribution of Unadjusted Inter-Rater Reliability Coefficients of 40 Synthetic Interest- and Need-Requirement Estimates for 79 Occupations

Reliability Coefficient	Unadjusted r for 3 Raters		Unadjusted Intraclass r	
	Frequency	Cumulative Proportion	Frequency	Cumulative Proportion
.95 - 1.00	0	1.000	0	1.000
.90 - .94	18	1.000	0	1.000
.85 - .89	10	.550	0	1.000
.80 - .84	7	.300	4	1.000
.75 - .79	3	.125	10	.900
.70 - .74	1	.050	9	.650
.65 - .69	0	.025	5	.425
.60 - .64	1	.025	3	.300
.55 - .59	0	.000	4	.225
.50 - .54	0	.000	3	.125
.45 - .49	0	.000	1	.050
.40 - .44	0	.000	0	.025
.35 - .39	0	.000	1	.025
.30 - .34	0	.000	0	.000
.25 - .29	0	.000	0	.000
.20 - .24	0	.000	0	.000
.15 - .19	0	.000	0	.000
.10 - .14	0	.000	0	.000
.05 - .09	0	.000	0	.000
.00 - .04	0	.000	0	.000
	40		40	

Table 60. Frequency Distribution of Adjusted Inter-Rater Reliability Coefficients of 40 Synthetic Interest- and Need-Requirement Estimates for 79 Occupations

Reliability Coefficient	Adjusted r for 3 Raters		Adjusted Intraclass r	
	Frequency	Cumulative Proportion	Frequency	Cumulative Proportion
.95 - 1.00				
.90 - .94	18	1.000	0	1.000
.85 - .89	11	.550	0	1.000
.80 - .84	6	.275	4	1.000
.75 - .79	4	.125	11	.900
.70 - .74	0	.025	8	.625
.65 - .69	0	.025	6	.425
.60 - .64	1	.025	2	.275
.55 - .59	0	.000	4	.225
.50 - .54	0	.000	4	.125
.45 - .49	0	.000	0	.025
.40 - .44	0	.000	0	.025
.35 - .39	0	.000	1	.025
.30 - .34	0	.000	0	.000
.25 - .29	0	.000	0	.000
.20 - .24	0	.000	0	.000
.15 - .19	0	.000	0	.000
.10 - .14	0	.000	0	.000
.05 - .09	0	.000	0	.000
.00 - .04	0	.000	0	.000
	40		40	

APPENDIX K

MEAN INVENTORY SCORES OF INCUMBENTS BY OCCUPATION

Table 41. Mean Satisfaction Scores of Incumbents by Occupation

N	Occupation	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
24	Teller, Bank	15.54	16.67	16.71	14.08	15.38	14.88	12.96	16.88	14.75	16.04	18.08	15.21	15.92	17.58	17.75	15.83	15.50	15.58	16.50	17.29	64.33
22	Manager, Branch Bank	17.27	17.68	17.32	15.68	17.91	15.14	11.23	18.00	15.73	17.18	19.27	13.68	18.09	17.64	19.27	18.95	15.77	15.50	17.23	18.36	67.59
25	Key Punch Operator	16.64	16.88	17.16	12.80	15.28	14.28	13.52	16.28	14.40	16.04	17.96	13.96	14.84	17.24	15.44	14.48	14.60	15.32	17.60	14.76	62.28
6	Manager, Ass't. Branch Bank	16.33	17.83	17.17	17.17	16.33	16.17	13.67	18.83	15.67	17.67	18.00	15.33	17.83	18.00	17.33	19.17	17.00	16.83	17.33	19.00	68.83
16	Electrical Engineer	13.56	14.63	14.44	12.50	14.63	13.38	13.56	15.75	16.75	15.25	16.31	13.38	15.00	14.88	12.81	13.31	14.19	14.13	15.50	13.00	57.81
29	Electronics Technician	13.90	14.66	14.45	12.00	14.48	12.17	13.41	16.41	15.14	16.10	17.67	14.03	14.97	15.93	14.00	14.10	16.14	15.38	14.90	15.69	59.03
20	Corrections Officer	15.50	16.63	16.50	15.05	15.75	14.15	9.85	17.45	12.35	14.15	15.45	14.30	14.65	17.64	17.25	14.85	15.50	15.35	16.25	14.45	61.50
6	Salesman, Real Estate	22.00	22.67	21.50	19.50	19.33	19.17	20.83	18.00	21.17	19.83	20.50	20.50	19.83	17.67	21.33	21.33	15.33	15.67	19.83	20.00	79.50
28	Librarian	17.18	17.79	18.46	15.18	15.50	14.07	15.75	16.57	16.82	17.25	20.11	15.00	17.18	17.64	19.07	14.93	16.07	16.07	16.75	12.96	65.71
15	Machinist	17.20	17.33	17.67	9.87	13.40	12.20	10.73	18.20	16.40	17.47	19.67	14.93	16.47	14.00	16.00	15.27	17.06	15 40	16.73	14.93	63.73
10	Production Machine Operator	19.40	20.20	19.80	16.20	15.50	17.70	17.60	19.60	19.10	19.90	21.30	19.60	18.80	19.60	19.80	18.50	19.70	19.20	19.50	18.40	76.30
20	Order Filler	14.20	15.50	17.40	11.00	14.05	15.65	13.85	18.00	13.50	15.20	16.95	13.25	14.55	15.10	15.25	13.95	15.35	14.70	14.55	14.20	59.40
23	Shipping Clerk II	15.04	15.52	15.87	11.96	14.22	15.13	13.57	16.78	14.91	15.74	17.26	13.78	15.00	15.87	15.22	14.57	14.86	14.74	15.04	12.87	59.43
24	Stock Clerk	14.50	15.58	16.63	12.13	15.38	14.25	13.33	15.25	15.25	15.58	17.17	13.63	15.54	16.96	16.00	14.75	14.17	13.96	15.50	13.46	60.04
20	Case Worker	14.95	15.30	17.35	10.75	13.90	10.35	11.70	17.25	13.55	15.20	16.80	13.95	15.55	16.50	17.05	14.70	12.20	11.70	13.70	12.75	57.70
18	Fish and Game Warden	18.83	18.44	19.67	13.78	15.50	13.61	14.22	17.89	17.83	19.17	19.11	15.33	18.33	19.94	18.11	16.83	16.22	16.00	19.72	18.67	69.67
21	Manager, Retail Food Store	19.57	19.62	19.52	19.43	18.14	18.57	16.76	18.19	19.24	16.33	19.57	17.62	19.24	19.05	19.38	16.95	19.33	19.10	18.71	19.67	74.52
3	Welder, Combination	15.00	13.33	15.67	13.67	14.67	14.00	16.00	14.67	13.67	16.33	14.33	15.67	14.67	15.67	11.33	13.00	12.67	14.33	16.33	14.00	58.33
7	Manager, Motel	16.86	18.14	18.71	13.71	18.43	12.57	16.43	17.43	17.14	17.14	18.43	14.29	18.71	14.57	18.00	16.86	13.71	12.43	17.00	18.00	65.14
6	Manager, Theater	18.67	18.67	18.83	16.00	17.17	16.17	15.33	16.00	20.00	18.33	14.67	16.33	20.83	19.67	15.33	16.50	18.17	18.00	19.00	19.00	69.67
24	Typist	13.83	14.75	14.79	9.33	13.67	13.38	10.63	15.96	12.58	14.58	17.42	13.29	14.54	16.00	14.63	13.25	15.25	14.46	13.13	12.63	55.42
25	Secretary	17.36	16.96	16.24	12.96	14.52	13.64	11.40	16.12	14.80	16.64	18.44	16.12	15.88	16.52	15.92	14.64	17.32	17.36	16.52	16.00	63.64
21	Audit Clerk	15.95	16.62	17.43	10.29	13.62	13.67	12.81	15.90	13.00	16.10	19.38	12.67	15.04	17.48	15.71	15.00	14.95	16.00	16.00	15.33	60.67
6	File Clerk	15.33	16.83	17.50	8.50	14.00	15.00	10.33	15.83	14.83	17.00	20.33	12.00	17.00	18.00	17.00	14.33	18.17	17.83	14.17	15.50	62.33
15	Manager, Newspaper Circ.	19.40	18.53	19.73	16.80	19.47	17.80	17.67	18.67	19.53	16.93	19.33	16.40	19.87	20.67	18.47	18.60	18.80	17.60	19.40	17.80	74.80
31	Nurse	17.13	17.39	17.87	15.19	16.06	13.77	14.84	16.29	17.00	15.84	18.16	15.26	17.00	17.61	18.61	15.29	16.32	16.23	17.13	13.90	65.65
20	Nurse Aide	16.35	16.65	16.75	12.80	15.75	12.65	12.95	14.65	16.15	15.05	18.00	14.80	15.65	15.95	18.95	14.25	15.25	15.60	15.80	13.75	61.50
22	Loom Fixer	15.77	15.68	16.45	13.36	15.00	12.50	12.09	16.32	13.68	15.27	17.09	13.28	15.36	15.41	15.09	15.50	14.00	15.05	15.14	10.50	59.82
26	Carpenter (apprentice)	16.04	18.12	18.19	14.46	15.38	15.00	13.92	15.88	15.42	15.50	17.50	14.38	14.50	15.62	16.12	15.23	16.08	17.19	17.73	14.96	63.62
8	Mason (apprentice)	16.25	15.75	17.75	16.63	15.38	16.00	14.38	16.50	15.13	16.13	16.63	16.13	15.75	13.25	15.25	16.50	17.38	17.13	17.25	15.50	63.38
34	Teacher, Elementary	17.62	17.24	17.97	12.85	15.21	13.53	12.18	16.59	18.12	16.06	18.62	13.21	16.97	16.29	17.88	15.00	14.94	14.35	16.82	12.44	63.12
18	Computer Programmer	16.22	17.61	16.61	13.89	15.06	14.67	15.39	17.33	17.22	16.94	18.72	15.83	16.72	17.56	16.78	15.89	16.94	17.00	16.17	15.00	65.73
17	Salesman, Life Insurance	18.65	19.00	17.35	17.24	15.76	17.41	17.65	18.29	18.82	18.24	19.35	18.06	18.24	18.47	19.53	17.18	18.18	17.88	17.88	17.00	73.06
21	General Office Clerk	14.62	14.24	16.52	10.19	15.14	12.71	11.90	16.28	13.33	16.00	16.95	13.14	15.81	17.10	15.86	13.71	13.29	14.10	15.19	12.10	57.43
15	Spinner	16.40	16.93	17.80	12.80	14.67	16.47	15.80	17.00	14.80	18.13	18.13	15.00	15.40	17.33	16.33	14.40	17.33	16.40	13.47	15.33	64.73
20	Winder Tender	18.60	17.80	18.25	14.70	15.80	17.00	15.05	18.30	14.70	18.25	19.35	15.70	15.35	17.55	17.40	16.85	17.60	16.30	16.65	16.75	68.35
18	Draw Frame Tender	16.50	18.67	18.78	14.61	15.94	18.00	14.72	19.17	15.89	17.17	18.28	18.00	16.44	17.44	17.11	16.33	17.56	17.56	17.50	16.78	68.72
21	Firefighter	17.86	19.10	16.71	13.52	16.19	13.76	13.61	19.52	15.76	16.67	19.67	15.90	16.33	20.10	20.67	16.71	16.52	16.76	17.24	16.81	68.05
49	Assembler, Elect. Controls	15.43	15.94	16.33	11.18	14.53	14.49	11.31	16.71	14.16	16.08	17.98	13.80	14.57	14.47	15.86	14.55	15.47	15.22	16.27	14.57	57.35
11	Chemist, Organic	15.00	16.27	15.55	12.73	13.64	10.73	12.27	15.18	16.00	16.91	18.18	13.64	15.27	13.73	13.55	13.27	14.09	14.00	15.36	13.45	58.00
24	Lab Tester II	11.79	15.04	14.54	9.75	13.46	11.42	9.88	17.17	13.58	15.38	18.08	12.17	14.50	16.71	12.71	13.38	14.63	15.88	13.33	15.79	56.63
0	Patrolman	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	Wood Technologist	14.92	16.62	16.54	15.23	15.46	14.15	15.62	16.31	14.69	17.23	19.15	14.00	16.38	17.46	15.15	15.46	15.23	14.31	16.46	16.31	63.92
0	Tobacco Grower	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11	Bookkeeping Machine Operator	15.18	17.00	17.09	10.91	14.00	11.09	12.18	17.91	12.73	15.64	17.91	11.18	13.64	16.64	16.09	15.45	12.27	12.36	16.91	13.00	59.73
0	Psychologist	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11	Licensed Practical Nurse	14.55	17.18	14.82	9.82	13.64	9.82	11.09	15.00	12.55	14.27	17.91	12.18	13.64	15.18	18.82	15.55	10.82	13.00	13.00	11.91	54.64
7	Other (N.E.C.)	15.00	16.86	16.57	11.43	13.14	14.43	10.71	16.57	15.00	16.86	18.71	14.29	14.29	15.28	15.71	13.00	15.86	15.29	14.86	11.00	58.42
831	Total--All Occupations	16.17	16.85	17.07	13.18	15.22	14.22	13.33	16.91	15.44	16.32	18.20	14.56	16.00	16.75	16.70	15.29	15.70	15.62	16.27	14.96	63.11

*Note: 1=Ability Utilization, 2=Achievement, 3=Activity, 4=Advancement, 5=Authority, 6=Company Policies and Practices, 7=Compensation, 8=Co-Workers, 9=Creativity, 10=Independence, 11=Moral Values, 12=Recognition, 13=Responsibility, 14=Security, 15=Social Service, 16=Social Status, 17=Supervision--Human Relations, 18=Supervision--Technical, 19=Variety, 20=Working Conditions, 21=General.

Table 62. Mean Need Scores of Incumbents by Occupation

N	Occupation	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TCT
20	Teller, Bank	1.89	1.75	0.68	1.92	-0.44	1.82	1.32	0.90	1.02	0.11	1.30	1.33	0.96	1.39	1.56	0.01	1.36	1.11	0.65	1.26	65.85
20	Manager, Branch Bank	1.69	1.78	0.35	1.80	0.52	1.04	1.54	0.56	1.45	-0.21	1.74	1.17	1.49	0.63	1.16	0.41	1.09	0.75	0.56	0.70	52.00
24	Key Punch Operator	1.78	1.88	0.82	1.82	0.12	1.45	1.42	1.08	1.26	0.47	1.10	1.76	1.38	1.30	1.30	0.08	1.23	1.04	0.92	1.48	80.67
6	Manager, Ass't. Branch Bank	1.35	1.85	0.28	2.20	-0.30	1.23	1.87	0.38	1.67	-0.03	0.95	1.50	1.22	0.98	0.55	0.77	1.38	0.63	0.50	0.75	57.17
18	Electrical Engineer	1.29	1.59	-0.43	1.73	-0.03	0.77	1.07	0.53	1.12	-0.48	0.92	1.23	1.10	0.85	0.27	-0.32	0.74	0.28	-0.00	0.55	52.39
33	Electronics Technician	1.79	1.94	0.26	1.77	0.31	1.22	1.33	0.77	1.40	0.03	1.58	1.32	1.40	1.25	0.99	-0.03	1.00	0.69	0.44	1.01	50.84
16	Corrections Officer	1.56	1.62	0.11	1.46	-0.26	1.27	1.31	0.87	0.81	-0.23	1.38	1.09	0.81	1.57	1.50	0.57	1.16	1.08	0.23	1.23	91.31
6	Salesman, Real Estate	1.10	1.78	0.51	1.80	1.00	0.95	0.63	0.53	1.38	0.01	1.22	1.38	1.48	0.73	1.32	1.13	0.83	0.70	0.50	0.53	89.33
28	Librarian	1.59	1.66	0.27	1.24	-0.08	1.06	0.84	0.57	1.43	-0.06	1.31	0.86	1.29	0.69	1.24	-0.27	0.96	0.55	0.44	0.86	62.07
15	Machinist	1.40	1.23	-0.01	1.75	0.43	1.31	1.73	0.96	1.23	0.34	1.09	1.19	1.11	1.71	0.91	0.23	1.21	0.72	0.68	1.46	112.00
9	Production Machine Operator	1.46	1.70	0.89	1.81	-0.24	1.23	0.88	0.93	0.81	0.88	1.33	0.96	0.50	1.98	1.07	0.41	1.31	1.12	0.60	1.52	97.44
17	Order Filler	1.42	1.65	0.55	1.72	-0.04	0.91	1.49	1.23	0.76	-0.08	0.75	1.26	0.75	1.40	1.38	0.54	0.88	0.86	0.83	1.15	113.18
19	Shipping Clerk II	1.25	1.71	0.94	1.64	-0.26	1.26	1.40	0.96	0.79	0.16	1.33	1.24	0.81	1.74	1.26	-0.02	1.32	1.19	0.63	1.33	97.84
22	Stock Clerk	1.75	1.75	0.75	1.88	0.43	1.51	1.66	1.12	1.36	0.25	1.20	1.64	1.23	1.76	1.50	0.65	1.27	1.12	0.70	1.51	118.59
20	Case Worker	1.68	1.64	0.34	1.18	-0.08	1.81	1.07	0.88	1.34	0.27	1.96	0.73	1.24	0.84	1.84	-0.34	1.27	1.14	0.43	1.10	56.85
18	Fish and Game Warden	1.57	2.05	0.33	1.99	0.30	1.66	1.35	0.76	1.39	0.40	2.23	1.42	1.32	1.63	1.09	0.06	1.63	0.97	0.86	1.48	50.06
21	Manager, Retail Food Store	1.89	1.75	0.58	2.20	0.34	1.27	1.30	0.42	1.52	-0.43	1.06	1.19	1.39	1.33	1.46	0.34	1.19	1.03	0.60	1.15	65.76
3	Welder, Combination	2.23	2.47	1.80	2.60	1.20	2.67	2.23	2.00	2.40	1.77	2.00	2.00	2.07	2.67	2.10	0.93	2.03	2.13	1.60	2.63	123.67
13	Manager, Motel	1.47	1.71	0.29	1.65	0.38	1.12	1.05	0.50	1.26	-0.36	0.87	1.30	1.21	1.21	0.88	0.08	1.03	0.85	0.45	0.88	67.46
5	Manager, Theater	1.34	1.30	0.04	1.42	-0.30	0.46	1.02	0.20	1.74	-0.64	1.00	0.90	1.48	0.90	0.82	0.34	0.48	0.20	0.80	0.32	74.20
23	Typist	1.57	1.66	0.47	1.85	0.03	1.36	1.39	0.97	1.10	0.69	1.26	1.17	1.03	1.39	1.19	-0.10	1.10	0.88	0.62	1.35	79.39
26	Secretary	1.60	1.77	0.82	1.83	-0.10	1.32	1.61	0.95	1.36	0.47	1.03	1.25	1.23	1.18	1.18	0.08	1.24	0.98	0.70	1.37	67.00
21	Audit Clerk	1.70	1.79	0.72	1.97	-0.32	1.69	1.61	0.59	1.01	0.22	1.43	1.32	1.00	1.42	1.17	0.01	1.35	1.05	0.60	1.29	62.38
5	File Clerk	1.48	1.76	-0.02	2.00	0.40	1.34	1.96	1.34	1.34	0.34	0.74	1.78	1.42	1.44	1.16	1.04	1.34	1.12	0.74	1.64	107.40
15	Manager, Newspaper Circ.	1.59	1.83	0.43	1.90	0.56	1.40	0.93	0.41	1.73	-0.31	1.71	1.41	1.77	0.94	1.18	-0.14	1.21	0.82	0.63	0.88	46.47
31	Nurse	1.83	1.82	0.22	1.21	-0.13	1.28	0.87	0.66	1.29	-0.53	1.45	0.98	1.05	0.99	1.68	-0.18	1.20	0.97	0.27	1.10	57.45
17	Nurse Aide	1.52	1.59	0.36	1.59	0.02	1.26	1.25	0.86	1.14	-0.33	0.91	0.95	1.02	1.09	1.76	-0.28	1.16	0.94	0.58	1.49	91.35
20	Loom Fixer	1.28	1.48	0.72	1.45	0.26	1.40	1.47	0.93	0.97	0.61	1.36	1.29	0.99	1.57	1.36	0.59	1.42	1.22	0.62	1.44	110.10
13	Carpenter (apprentice)	1.51	1.37	0.59	1.84	0.69	1.25	1.23	1.00	1.38	0.12	0.76	1.16	1.45	1.58	1.03	0.28	1.25	1.05	0.75	1.42	143.31
6	Mason (apprentice)	1.58	1.78	1.23	1.43	0.85	0.50	0.35	0.73	1.63	1.55	0.68	1.35	1.78	1.25	1.18	0.88	0.58	0.55	1.40	1.23	158.50
35	Teacher, Elementary	1.74	1.65	0.20	1.23	-0.38	1.33	0.96	0.69	1.27	-0.07	1.28	0.97	1.04	0.94	1.14	-0.02	0.96	0.57	0.41	1.31	74.74
18	Computer Programmer	1.39	1.45	-0.24	1.12	-0.25	1.12	0.76	0.85	1.18	-0.39	1.64	0.86	1.04	0.69	1.04	-0.51	0.75	0.41	-0.11	0.64	53.00
17	Salesman, Life Insurance	2.26	2.29	0.52	1.90	0.29	1.23	1.19	0.74	1.72	0.55	1.86	1.21	1.59	1.06	1.81	0.79	1.22	0.94	0.83	0.92	56.12
21	General Office Clerk	1.37	1.54	0.30	1.60	-0.51	1.32	1.41	0.81	0.63	0.08	1.35	1.05	0.81	1.35	1.25	0.03	1.12	0.88	0.22	1.43	74.86
40	Spinner	1.57	1.53	0.43	1.45	-0.38	1.39	0.85	1.01	0.73	0.42	1.34	1.06	0.55	1.61	0.93	-0.12	1.17	1.03	0.36	1.49	91.04
18	Winder Tender	1.24	1.34	0.25	1.00	-0.46	0.92	1.24	0.81	0.52	0.24	1.27	0.81	0.42	1.39	1.12	-0.03	0.88	0.91	0.21	1.24	106.39
10	Draw Frame Tender	1.86	1.62	0.86	2.05	0.49	1.49	1.46	0.91	1.37	0.32	1.70	1.24	1.41	1.86	1.55	0.42	1.45	1.34	0.92	1.47	101.50
20	Firefighter	1.31	1.26	0.39	1.64	0.12	1.36	1.27	0.98	0.96	0.31	0.91	0.92	0.96	1.75	1.43	0.29	1.26	1.18	0.63	1.32	127.30
45	Assembler, Elect. Controls	1.55	1.58	0.93	1.63	-0.17	1.16	1.44	0.76	0.92	0.28	1.31	1.02	0.74	1.62	1.15	0.21	1.15	0.97	0.25	1.45	91.73
11	Chemist, Organic	1.28	1.47	-0.07	1.25	-0.15	0.67	1.10	0.40	1.32	-0.28	1.63	0.88	1.17	0.98	0.55	-0.33	1.13	0.10	0.37	0.66	59.00
22	Lab Tester II	1.50	1.75	0.19	1.86	0.07	1.38	1.52	0.90	0.98	-0.19	1.22	1.25	0.98	1.54	0.90	0.32	1.42	0.83	0.31	1.28	64.45
0	Patrolman	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	Wood Technologist	1.41	1.56	-0.33	1.29	-0.39	0.73	0.87	0.38	1.15	-0.64	1.52	0.86	0.99	0.71	0.46	-0.45	0.92	0.66	0.08	0.32	55.86
0	Tobacco Grower	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10	Bookkeeping Machine Operator	1.97	2.09	1.07	2.25	0.29	1.58	1.76	1.19	1.35	0.71	0.93	1.75	1.22	1.95	1.23	0.17	1.63	1.36	1.30	1.98	69.90
19	Psychologist	1.56	1.68	-0.40	1.08	-0.16	0.76	0.42	0.75	1.74	-0.51	1.28	0.98	1.42	0.35	0.64	0.04	0.37	-0.18	0.16	0.46	37.68
9	Licensed Practical Nurse	1.57	1.67	0.36	1.60	-0.42	1.61	1.00	0.84	1.01	0.22	1.36	0.92	0.86	1.39	1.62	-0.34	1.08	0.91	0.64	1.67	108.67
5	Other (N.E.C.)	1.36	1.74	0.76	1.86	0.42	0.72	1.34	0.70	1.64	-0.02	1.40	1.16	1.38	1.44	0.72	0.26	0.78	0.58	1.14	0.86	104.00
797	Total--All Occupations	1.59	1.68	0.41	1.64	0.01	1.27	1.25	0.80	1.19	0.08	1.32	1.16	1.11	1.27	1.20	0.10	1.14	0.87	0.51	1.18	77.73

*Note: 1=Ability Utilization, 2=Achievement, 3=Activity, 4=Advancement, 5=Authority, 6=Company Policies and Practices, 7=Compensation, 8=Co-Workers, 9=Creativity, 10=Independence, 11=Moral Values, 12=Recognition, 13=Responsibility, 14=Security, 15=Social Services, 16=Social Status, 17=Supervision--Human Relations, 18=Supervision--Technical, 19=Variety, 20=Working Conditions, TCT=Total Circular Triads.

Table 63. Mean Interest Scores of Incumbents by Occupation

N	Occupation	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
23	Teller, Bank	17.91	18.74	21.70	32.04	29.96	19.91	19.83	33.52	27.30	24.78	21.87	28.83	27.61	24.65	22.83	25.30	30.00	34.09	32.78	28.30	30.35	30.39	33.22	24.09
22	Manager, Branch Bank	19.05	22.09	21.91	26.55	22.91	21.50	26.68	31.55	24.36	21.64	34.59	32.41	34.32	32.27	31.95	33.32	37.64	43.77	29.64	35.64	29.00	26.95	39.50	27.50
24	Key Punch Operator	18.67	18.63	25.29	37.29	31.33	22.04	21.33	35.63	35.17	29.04	35.04	31.67	30.08	27.08	26.46	25.79	32.96	35.04	36.25	28.25	31.46	31.92	37.83	27.83
6	Manager, Ass't. Branch Bank	15.83	22.00	18.33	21.67	21.83	20.83	24.00	24.33	19.33	19.00	30.17	33.33	37.83	35.00	26.67	33.17	39.00	40.17	27.50	29.83	31.50	26.17	32.33	22.00
19	Electrical Engineer	17.74	28.21	19.89	22.21	18.58	21.79	34.68	25.58	21.89	19.84	31.37	24.79	36.53	37.74	31.95	41.58	31.79	38.00	27.53	34.32	30.58	24.21	33.52	30.47
32	Electronics Technician	18.91	29.81	20.03	25.06	20.84	23.00	36.09	25.91	22.09	19.63	33.00	25.53	32.03	35.25	36.16	41.00	29.44	37.81	29.22	34.41	28.78	25.59	32.19	26.53
20	Corrections Officer	23.85	35.05	27.10	30.85	31.85	32.75	36.85	35.30	36.90	25.20	37.75	27.80	31.50	34.25	38.95	34.30	35.30	37.65	28.65	32.30	30.75	28.25	35.55	26.90
7	Salesman, Real Estate	23.00	28.14	25.00	25.14	21.00	24.14	28.42	30.29	23.43	24.29	32.86	28.57	27.86	33.14	30.28	33.85	35.42	39.28	32.86	37.43	28.29	28.57	34.00	30.29
29	Librarian	18.07	19.48	22.76	27.34	24.69	20.62	23.14	31.76	23.34	22.96	30.34	40.10	24.41	27.79	26.79	27.48	35.10	36.03	35.79	24.86	31.34	27.10	35.17	23.03
15	Machinist	19.87	33.33	20.00	28.27	27.27	28.40	33.87	29.93	25.80	22.67	37.60	26.40	33.47	38.00	37.73	38.07	33.40	38.80	29.93	33.73	26.33	26.60	34.93	28.40
10	Production Machine Operator	23.30	31.40	37.20	40.50	39.00	37.70	30.90	40.69	39.90	34.70	36.50	25.80	31.10	29.70	31.50	29.60	29.90	35.50	31.50	34.00	24.20	27.20	37.40	31.70
20	Order Filler	22.00	22.80	29.05	32.40	34.40	27.25	24.75	36.95	33.10	26.35	31.40	26.15	27.50	27.60	26.65	26.30	31.20	31.25	31.30	31.50	27.85	29.40	29.90	27.10
23	Shipping Clerk II	23.52	25.35	29.04	34.13	32.09	32.09	26.13	34.83	32.26	27.96	29.17	24.48	26.22	27.04	27.26	24.74	26.09	29.22	27.57	28.35	24.78	24.22	29.70	25.30
24	Stock Clerk	25.46	31.21	27.25	29.46	30.08	31.17	34.04	34.75	26.58	24.71	33.83	26.21	31.96	34.79	36.29	34.13	30.42	37.04	29.08	36.04	27.41	25.33	31.88	25.79
20	Case Worker	17.95	21.70	23.80	36.40	24.40	22.30	23.70	34.05	30.00	26.75	35.50	33.90	27.25	28.45	27.60	29.65	39.15	36.60	36.15	29.05	33.30	29.75	41.30	29.95
18	Fish and Game Warden	21.33	32.11	21.55	27.28	23.56	27.33	36.00	26.11	24.39	22.11	39.28	28.39	33.56	27.39	38.78	39.39	35.17	39.00	30.11	33.22	27.61	25.89	35.28	30.89
21	Manager, Retail Food Store	22.10	27.05	24.48	26.43	29.10	28.48	27.86	33.81	25.57	21.71	34.38	28.71	36.62	36.14	36.33	33.48	36.67	43.81	31.67	34.24	25.71	26.76	34.52	23.81
3	Welder, Combination	28.33	34.33	31.33	32.33	33.67	36.33	34.00	36.67	35.00	37.67	24.33	38.00	41.00	39.00	33.33	40.67	39.67	41.67	39.00	39.67	37.00	37.33	36.33	37.00
13	Manager, Motel	20.62	27.92	30.46	24.00	24.23	27.38	29.77	35.23	25.08	25.08	32.62	26.31	31.92	34.62	28.00	33.69	34.54	39.77	30.08	33.00	25.23	24.92	33.92	26.38
6	Manager, Theater	19.00	25.50	26.00	23.83	24.83	23.00	29.50	29.00	23.83	22.67	35.83	30.67	29.00	29.83	24.00	32.83	34.00	36.17	31.00	30.17	29.50	33.00	34.00	24.33
24	Typist	17.50	17.21	25.08	31.38	33.67	21.13	19.50	34.63	31.21	25.92	31.21	25.42	22.79	24.21	22.25	23.08	29.13	34.13	30.17	27.17	28.04	27.21	32.04	26.17
25	Secretary	19.76	19.32	24.84	34.68	36.72	23.16	20.64	34.80	30.08	26.72	32.72	31.04	27.36	25.56	24.40	23.96	31.52	37.36	34.12	28.44	29.80	29.88	35.80	24.36
21	Audit Clerk	18.05	16.62	25.38	34.10	33.95	21.29	18.76	35.57	33.10	24.86	30.24	26.52	31.24	25.38	22.19	21.81	30.48	35.05	28.86	26.19	25.71	23.90	32.67	26.14
6	File Clerk	20.50	21.50	32.17	34.33	44.00	27.67	25.67	40.50	31.50	33.83	37.00	33.83	36.00	33.33	24.17	30.17	40.50	40.83	39.00	32.00	37.00	36.83	41.00	25.17
15	Manager, Newspaper Circ.	21.27	29.73	23.33	24.47	25.00	25.13	32.87	32.73	25.47	22.27	36.47	30.53	35.00	35.67	33.73	37.27	38.93	45.27	34.13	40.27	27.33	28.73	36.07	28.60
31	Nurse	18.19	17.90	22.42	38.84	22.19	19.94	20.52	28.35	43.55	24.26	33.13	29.32	22.52	26.26	27.19	24.52	30.81	34.94	31.55	25.35	30.16	29.23	35.00	37.35
20	Nurse Aide	21.55	20.05	27.10	39.40	35.55	25.20	21.65	32.55	45.90	28.40	31.50	26.50	22.30	23.45	24.35	21.00	29.00	32.60	27.05	26.10	28.45	26.20	31.55	31.75
22	Loom Fixer	23.68	35.64	24.14	28.14	24.14	32.05	34.14	29.41	24.91	20.82	34.14	23.50	28.18	28.36	34.77	31.59	28.18	36.05	28.32	31.00	27.41	24.68	29.23	24.09
26	Carpenter (apprentice)	22.96	34.19	25.04	27.96	27.00	28.92	34.08	28.15	23.27	23.92	34.81	23.00	30.04	33.50	33.96	36.35	26.54	31.88	30.38	28.96	28.77	25.69	29.46	25.50
8	Mason (apprentice)	23.50	32.25	22.88	24.38	21.50	25.25	32.00	24.75	21.00	21.13	28.63	22.25	22.38	27.13	36.75	29.50	25.00	31.63	25.50	27.63	23.38	22.00	28.75	20.25
35	Teacher, Elementary	17.51	16.20	23.03	29.45	28.43	20.06	19.69	33.26	25.03	25.63	31.37	33.69	25.48	26.46	24.74	25.34	31.14	30.09	36.37	26.49	32.23	29.74	37.85	21.91
18	Computer Programmer	18.22	23.56	23.00	28.22	22.06	21.94	27.61	28.44	25.89	22.94	33.72	33.33	41.33	35.22	30.56	37.72	35.17	36.89	35.72	29.11	34.61	31.61	36.39	29.00
17	Salesman, Life Insurance	18.65	25.29	22.47	25.59	23.29	22.94	27.53	31.29	24.35	21.65	34.00	29.88	32.94	32.35	31.71	34.00	37.29	39.05	31.88	40.05	29.94	28.65	37.82	28.00
21	General Office Clerk	19.95	20.38	26.90	35.81	33.33	24.33	22.62	36.67	35.86	27.52	33.76	30.62	29.71	28.05	25.81	26.86	35.71	36.71	36.24	27.76	30.90	31.14	37.62	28.52
15	Spinner	19.47	18.60	26.47	33.00	37.13	26.27	19.93	33.27	31.53	28.20	27.67	26.20	26.93	21.33	22.47	19.20	24.80	30.53	25.67	25.60	24.20	22.80	29.67	21.73
20	Winder Tender	21.75	22.00	26.85	33.05	29.95	27.30	22.75	32.70	31.55	29.20	28.30	27.80	22.00	25.90	28.40	23.25	27.10	30.25	29.50	24.80	29.15	26.05	31.45	25.30
18	Draw Frame Tender	28.06	32.33	27.56	29.22	28.17	30.50	32.22	29.44	28.94	28.17	29.22	26.94	30.28	29.94	30.17	30.28	29.72	34.78	28.83	30.28	28.44	27.94	29.22	27.28
21	Firefighter	22.71	31.57	24.53	30.48	25.86	28.05	33.57	30.33	29.38	24.86	35.52	26.86	29.67	33.48	34.00	33.67	30.86	36.00	29.38	31.48	29.00	26.67	31.33	27.90
49	Assembler, Elect. Controls	24.29	25.53	29.73	35.90	38.06	31.43	26.02	38.35	36.33	31.37	32.53	28.65	28.96	28.55	27.84	25.51	29.82	33.43	32.20	30.55	26.39	26.08	34.53	28.35
11	Chemist, Organic	17.64	25.73	18.82	25.55	20.55	23.45	29.90	26.00	23.45	21.73	31.55	27.73	38.09	39.36	32.73	40.09	33.73	38.82	31.55	30.64	27.45	23.36	39.64	34.18
23	Lab Tester II	21.39	29.57	21.03	27.09	25.30	26.22	31.91	27.91	24.43	20.78	32.70	27.74	34.35	37.39	34.61	36.65	31.22	39.39	29.96	34.43	27.52	24.09	35.57	27.39
36	Patrolman	18.81	27.42	20.19	25.86	22.92	21.94	28.28	25.25	24.89	19.28	39.64	24.19	27.33	30.08	31.67	31.75	32.89	35.11	25.47	26.47	26.25	23.61	34.03	25.75
14	Wood Technologist	21.93	28.57	18.79	25.07	20.07	23.93	33.07	22.79	21.36	19.79	32.00	25.87	34.43	37.43	36.00	39.43	27.86	39.79	31.86	32.71	26.86	24.79	32.00	26.64
10	Tobacco Grower	22.80	31.90	25.00	29.50	27.80	28.70	34.50	32.10	28.20	23.10	33.00	31.50	37.70	37.60	41.40	38.10	35.60	40.80	30.30	36.70	27.30	27.60	37.90	32.80
10	Bookkeeping Machine Operator	18.90	19.50	24.90	34.40	36.40	24.00	21.30	37.30	34.90	30.10	31.50	29.30	28.80	24.60	20.40	25.00	30.60	35.90	32.80	26.40	23.70	26.60	35.60	27.70
19	Psychologist	16.63	24.79	17.89	24.84	17.58	18.68	29.37	23.63	25.58	20.47	35.95	32.63	35.68	35.37	30.47	38.00	38.16	41.53	31.32	29.10	34.53	29.89	41.68	34.00
10	Licensed Practical Nurse	17.50	18.80	25.30	41.00	29.70	22.00	22.30	32.00	43.10	27.80	33.00	27.80	24.10	24.30	23.40	22.30	29.90	29.10	31.90	25.20	26.90	26.20	34.60	30.80
7	Other (N.E.C.)	27.00	33.00	31.29	26.29	30.86	29.86	35.43	34.43	29.71	26.14	34.00	32.00	34.86	36.14	24.57	37.29	32.00	38.43	29.71	36.71	32.57	31.43	37.71	28.29
907	Total--All Occupations	20.62	25.11	24.43	30.42	28.09	25.25	27.33	31.73	28.95	24.73	33.24	28.56	29.83	30.52	29.82	30.52	31.98	36.05	31.10	30.32	28.74	27.18	34.37	27.33

*1=Manual Work, 2=Machine Work, 3=Personal Service, 4=Care of People or Animals, 5=Clerical Work, 6=Inspecting and Testing, 7=Crafts and Precise Operations, 8=Customer Services, 9=Nursing and Related Technical Services, 10=Skilled Personal Services, 11=Training, 12=Literary, 13=Numerical, 14=Appraisal, 15=Agriculture, 16=Applied Technology, 17=Promotion and Communication, 18=Management and Supervision, 19=Artistic, 20=Sales Representative, 21=Music, 22=Entertainment and Performing Arts, 23=Teaching, Counseling, and Social work, 24=Medical.

APPENDIX L

LIST OF PARTICIPATING COMPANIES

Administrative Computing Service

American Enka Company

A. M. Smyre Manufacturing Company

Athey Products Company

Bi-Rite Stores, Incorporated

Branch Bank and Trust Company

Carolina Power and Light Company

Carolinas Construction Training Council

Colonial Stores, Incorporated

Cornell Dublier Electronics

C. P. Clare and Company

City of Raleigh

Cone Mills Corporation

Corning Glass Works

Dickenson Elementary School

Dorothea Dix Hospital

Duke University Medical Center

First Citizens Bank and Trust Company

Halifax County Agricultural Extension Service

Jefferson Standard Life Insurance Company--Greensboro Agency

Mid-Atlantic Circulation Managers Association

Nash County Agricultural Extension Service

National Association of Theater Managers--Carolinas Division

National Register Records Center

North Carolina Department of Corrections

North Carolina Department of Motor Vehicles

North Carolina Department of Revenue

North Carolina Highway Commission

North Carolina Library

North Carolina Motel Association

North Carolina State Highway Patrol

North Carolina State University Business Office

North Carolina State University Computing Center

North Carolina State University Wood and Paper Science Department

North Carolina Wildlife Resources Commission

Occidential Life Insurance Company

Odell Hardware Company

Pilot Life Insurance Company

Pitt County Agricultural Extension Service

Sears, Roebuck and Company

Scovill Fluid Power Division

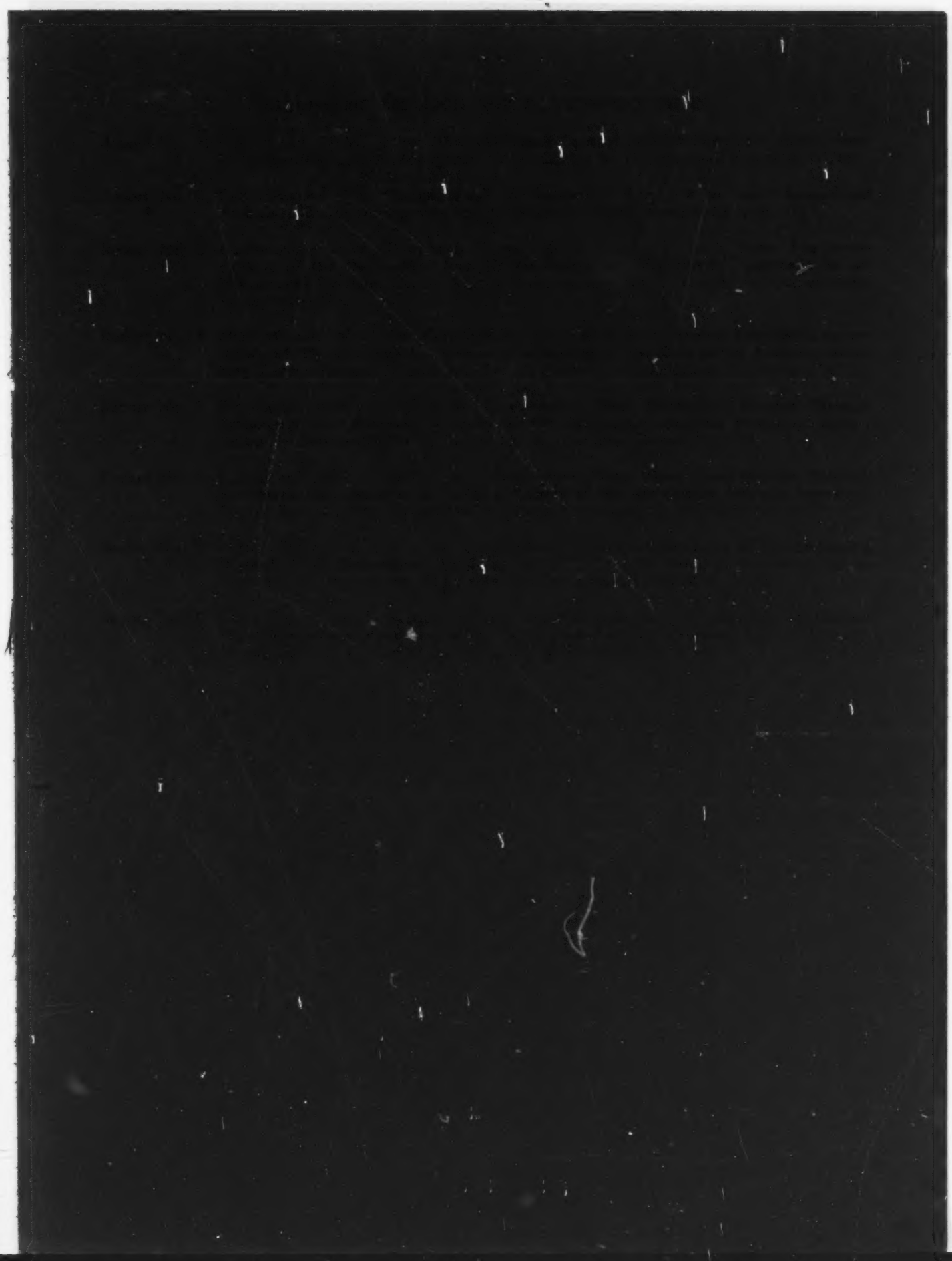
Sternberger Elementary School

Textiles, Incorporated

Triangle Universities Computing Center

Wake County Department of Social Services

Wake County Library

Wake County Schools

Western Electric